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UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 659

OFFICE OF THE SECRETARY

Contribution from the Office of Farm Management
W. J. SPILLMAN, Chief

Washington, D. C. ▼ June 17, 1918

A FARM MANAGEMENT STUDY OF COTTON FARMS OF ELLIS COUNTY TEXAS

A STATISTICAL STUDY OF THE INVESTMENT IN LAND AND EQUIPMENT, COST OF OPERATION AND OF PRODUCTION OF CROPS, AND INCOME FROM DIFFERENT TYPES OF TENURE IN 1914

By

REX E. WILLARD, Agriculturist

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This bulletin is based on data obtained in a survey of the business of 120 farms in Ellis County, Tex., in 1914.[1] In this survey the following factors were taken into consideration: Value of farm property; proportion of capital invested in land, buildings, implements, and machinery; feed inventories and cash for operating expenses; labor requirements for all crops, and amount of time available for farm work; receipts from various sources; expenses of all kinds, and miscellaneous minor factors influencing profits.

It must be understood that the records and observations concerning cotton farming in this publication apply to normal conditions before the European war. Due allowance must therefore be made concerning exceptional prices, conditions, and demands relating to agriculture at this time. The business hazard of a system of farming which depends almost wholly upon a single crop for income has been exhibited in seasons of large cotton crops as in 1911 and notably in 1914, with accompanying decline in price to the cost of production or below it, and comparatively low yields of other necessary

[1] Acknowledgment is due Messrs. C. E. Hoke, C. L. Goodrich, A. G. Smith, A. D. McNair, M. A. Crosby, F. D. Stevens, and E. A. Boeger, of the Office of Farm Management, and Mr. Walton Peteet, of the Texas Agricultural and Mechanical College, who assisted in collecting the data presented in this bulletin. Mr. H. H. Bennett, of the U. S. Bureau of Soils, assisted materially in the location of the soils (fig. 2) to which the conclusions of this survey are applicable.

crops which the farmer was compelled to buy at high prices. Besides, a system of one-crop farming as herein described exhausts soil fertility, and in the case of cotton it provides no means for employment of the farmer's time during a considerable part of the year. Incidentally, dependence upon cotton as a sole source of income with which to purchase the ordinary family and farm needs often results in denying the family a sufficient variety of wholesome food. During a considerable period of good prices for cotton this system is profitable if one considers profit to consist only of the returns from the year's operations; but during another period, with low prices prevailing, such a system would be disastrous. This survey, therefore, is to be taken as an analysis of the kind of farm described and as pointing the way to the best results under that system. It is not to be taken as an indorsement of the system, which has many evils, as appears incidentally throughout the bulletin, and as will be more apparent if the system is extended through a long period.

DEFINITIONS AND EXPLANATION OF TERMS

Owner operator.—This system of tenure is one in which the farm property is owned by the operator or manager of the farm. He lives on the farm, and in Ellis County generally does a considerable amount of manual labor.

Owner with cropper.—This system is similar to the owner operator, except that croppers, who receive half the crop which they produce, are utilized in place of hired or wage labor.

Owner additional.—This system is one in which the owner operator rents some additional land, either for cash or share rent, and operates this additional land with the owned land as a unit.

Owner additional with cropper.—A few farms of the owner additional system were found on which cropper labor was utilized on a part or all the owned land. These farms are limited in number.

Share rent.—This system is one under which all the land is share-rented by the operator, who pays the landlord a stipulated proportion of all crops produced. The landlord's customary share is one-fourth of the cotton and one-third of all other crops.

Share-cash rent.—This system is similar to the share rent, except that a part or all the land on which crops other than cotton are raised is paid for in cash rent. All land rented for cotton is on shares.

Independent cropper.—This system is either a system of labor or tenure, according to the viewpoint. In all systems where croppers are utilized the owners furnish the land, a tenant house, and generally a garden patch for the use of the cropper and his family. The land-

lord or operator also furnishes the teams and equipment necessary for the cultivation of the cropper's crops and pays for the ginning of one-half the cotton. In the case of the independent cropper the latter is the manager or operator of the whole farm. In other cases the cropper occupies only a portion of the farm and is supervised to a greater or lesser extent by the owner operator.

Owner, part rented out.—Several farms were found in the survey in which a part of the land owned by the operators was rented out. Such farms are classified as "owner, part rented out," but for the purpose of this survey this land that was rented out was entirely eliminated from the business of the owners.

Available days.—Records were obtained from 28 farms, showing the number of days, by months, that it was possible to do field work. These records were averaged, from which it was found that 211 days per year could be utilized for field labor.

Wage labor.—This term is used to designate the hired or paid labor per farm as distinct from the labor performed by the operator himself, or that of his family, or labor performed by croppers. The term "owner-wage" indicates that a farm is operated by its owner with wage labor and without cropper labor.

Man-labor cost.—This cost is composed of four component parts, namely, cost of hired or paid labor, value of family labor, whether actually paid for or not, value of the operator's own labor, and value of rations bought for or furnished to laborers.

Diversity index.—In order to ascertain to what degree diversification of enterprise is justified by local experience, it is desirable to have a definite means of measuring the degree of diversification on a farm. Such a measure may be determined as follows: First, find the sum of the magnitudes of all the farm enterprises (cost of production was used as representing magnitude), divide the magnitude of each enterprise by the sum above mentioned, square each of the quotients, and divide unity by the sum of these squares. The result is the diversity index.

Animal unit.—An animal unit is a mature horse or cow or as many smaller animals as required the equivalent in feed of a horse or cow, namely, 2 head of young cattle or colts, 5 hogs, 10 pigs, 7 sheep, or 100 hens.

Farm income.—The farm income is the difference between the total receipts and total expenses of the farm, not including interest on investment and value of operator's labor.

Income above rent.—This income is the amount that the operator actually receives for his labor after deducting the rent of the land and interest on his working capital, this interest being computed on the basis of the current rate of interest on vendor's lien notes, which is

8 per cent. This income is a measure of efficiency of farming. In general it varies with the size of the farm.

Percentage returns on the investment.—This term is used to designate the percentage income that the invested capital makes after deducting all expenses. It is determined as follows: The estimated value of the operator's labor is deducted from the farm income and this result is divided by the amount of the capital invested. It was found that on account of the wide variation in price of land between farms of approximately the same value it was necessary to equalize the land values in determining a measure of efficiency which eliminates size of business. Since the variation in price of land has scarcely any relation to the efficiency of farm operation, an average land value of $139 per acre was assumed for the purpose of determining the per cent return on the investment where this measure is used as a standard of efficiency.

AREA SURVEYED.

Ellis County is located in the northeastern part of Texas near the line between what are locally known as Central and North Texas (fig. 1). Waxahachie, the county seat, is approximately 30 miles south of Dallas. The area surveyed extends from north to south through the center of the county and also east from the center toward Ennis.

This area was chosen for several reasons: It was possible to find a large number of farms on the same soil type, i. e., the Houston black clay (fig. 2), thus making it possible to compare farms of similar practice, which is not possible on soils of widely different character; a comparison of census data for the pricipal "blackland" counties shows this to be one of the leading cotton-producing sections of the State; it is one of the oldest agricultural sections of the State, so that quite definite systems of farming have been established in local practice; and, finally, the farms of all of practically the same type. Since these conditions exist, the comparative study of farm organization, costs, efficiency, etc., is made possible.

TOPOGRAPHY.

The general surface of Ellis County is undulating to rolling, being cut by numerous small streams. The area occupied by the Houston black clay soil is generally more level than other parts of the county. The elevation varies from about 450 feet to 750 feet above sea level, Waxahachie being 551 feet.

Practically all of the drainage of the country is toward the south or southeast, through small streams to the Trinity River. Small

streams of the central and western portions come together toward the southern part of the county and join the Trinity south of Ellis County.

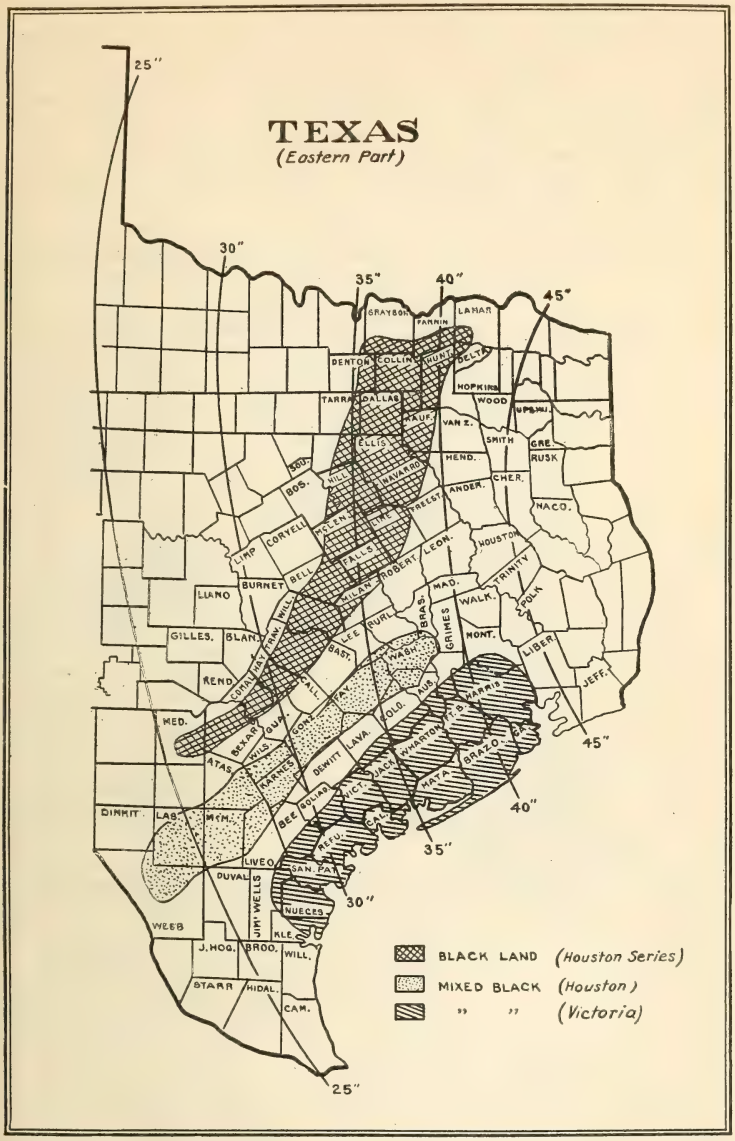

FIG. 1.—Map showing location of black lands of Texas, with lines of equal precipitation.

Most farms of the country are fairly well drained, but there are local areas both on the upland and along the streams that are not. Many areas along the streams, particularly near the Trinity River, are subject to overflow during high water.

SOILS.

The 13 soil types found in Ellis County vary from fine sand to stiff clay. Most of these soils are derived from marls and chalky limestones. The geological formations known as the Taylor Marl and Austin Chalk are the sources from which the Houston black clay is derived. The farms studied in this analysis are practically all located on this soil type (see map, fig. 2), and consequently a somewhat detailed description of this type is given.

The Houston black clay occupies more than one-third of Ellis County. The surface soil, to a depth of 10 inches, is very heavy,

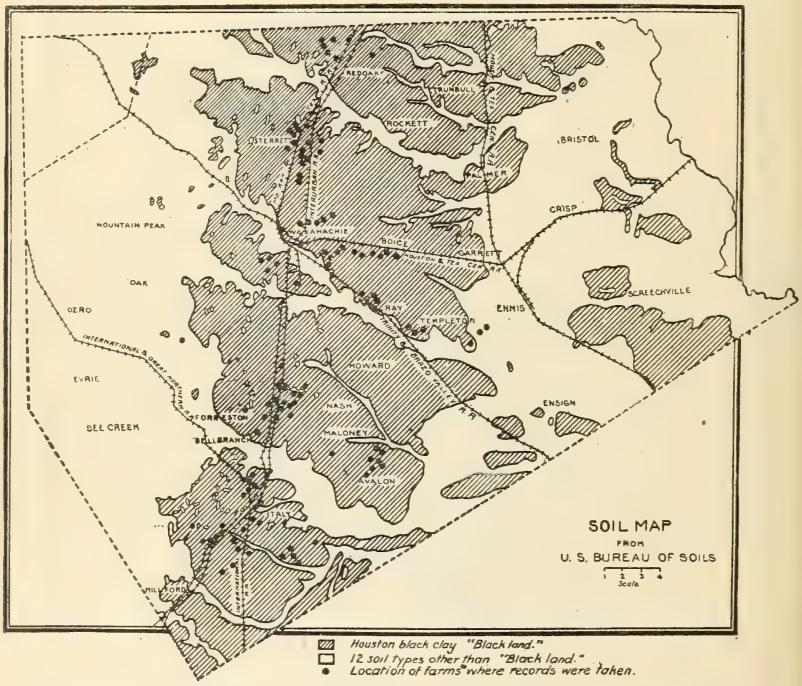

FIG. 2.—Map of Ellis County, showing soils and location of farms studied.

tenacious black clay. The subsoil has practically the same characteristics as the soil, although it is a little lighter in color, owing to a smaller percentage of organic matter.

The type is locally known as "black land." When dry and well cultivated it is very friable and easily worked. When plowed too wet it forms clods, but after they have been exposed to the weather for some time they break down to a certain degree and the soil can be put into good mechanical condition again by means of a light harrow. If not tilled the soil cracks badly in dry weather; sometimes the cracks are several inches wide and several feet in depth.

In wet weather, and especially during the winter months, this clay sticks to the wagon wheels in large quantities and it is frequently seen along the roads in piles where it has been removed.[1]

The Houston black clay is well adapted to the growth of cotton, corn, grain, and various legumes. Alfalfa does very well on the more level areas. Various other feed crops yield well when climatic conditions are favorable.

Another and closely related group of soils found in the southern part of Texas (see map, fig. 1) is known as the Victoria series.[2] These soils are more nearly level than the Houston series, but have the same general properties. Where climatic conditions are similar the same crop adaptations are found. Both series contain a high percentage of lime.

An area lying between the "black land" of the Houston series and the Victoria series (see map, fig. 1) contains considerable bodies of heavy black soil between areas of sandy and other light-textured soils. These areas of heavy land may belong to either the Houston or Victoria group.

CLIMATE.

Ellis County has a mild climate. The summers are rather long and hot. In winter the temperature is mild, except during the "northers," which occur at irregular intervals. The "northers" are a continuation of the blizzards of the Great Plains region of the United States and cause very sudden drops in temperature to points considerably below freezing.

The growing season is about eight months in duration, the average date of the last killing frost in the spring being March 21 and the first in the fall being November 10, according to the records of the U. S. Weather Bureau station at Waxahachie. The same authority reports the average annual rainfall as 35.44 inches. The greatest amount of rainfall occurs during May and June, being on the average 5.35 and 3.67 inches, respectively, for these months. Crops in this region suffer to about the same extent from excess rainfall as from drought. Lines of equal rainfall, showing the decrease in annual precipitation from east to west, may be seen on the map. (See fig. 2.)

[1] "A phase of the type known as 'Elm Thicket' land generally occupies level or gently sloping area paralleling the stream courses. It was originally covered by a dense timber growth, the greater percentage being elm. Though a few of these areas have never been cleared, the greater part has been cleared long enough to be free from stumps. This phase is considered a little more productive than the main body of the type. The soil is deep and very rich in organic matter."—Soil survey of Ellis County, Tex. Field Operations of the Bureau of Soils, U. S. Department of Agriculture, 1910.

[2] Bureau of Soils, U. S. Dept. Agr., Bul. 96, p. 251.

TRANSPORTATION AND MARKETS.

There are five steam railroads in Ellis County. (See fig. 1.) These lines extend generally north and south through the county; one crosses in a northwest-southeasterly direction and one extends east from Ennis. An electric interburban line connecting Waco, McLennon County, and Dallas, crosses the county in a general north and south direction, passing through Redoak, Waxahachie, Forreston, Italy, and Milford. This trolley line does little local business except the carrying of passengers.

The county is well covered with "pike" roads which connect all the principal towns as well as inland points, thus affording easy operation of farm wagons in hauling cotton. Many crossroads are not yet graveled, but these are gradually being improved. The ungraveled roads are practically impassable during wet seasons, so that the "pikes" are a considerable asset to the farmers. These improvements have been brought about by means of the sale of bonds issued for the purpose. About 20 per cent of the farm operators of the region operate automobiles, which is due quite largely to the fact that good roads are available for their use.

More than half the farms studied in this survey are less than 3½ miles from a market point where cotton gins are located. Practically all the farms of the county are less than 5 miles from a market point. Since cotton is a fairly concentrated product and is the chief source of income, this distance of farms from market has comparatively little influence on the price of farm land.

Cotton is usually sold to buyers shortly after it is ginned. The bales are sampled and prices are then quoted based on the market price at Galveston and New Orleans.

The local market for products other than cotton is limited, yet other crops show a higher margin of profit between cost and value, and this fact is suggestive of possibilities of greater profit under other conditions. Cotton cultivation here as in many other regions has developed because cotton is a more dependable crop under hard conditions and with indifferent cultivation, because it is readily salable and suffers comparatively little loss by exposure to weather, and because its effect upon soil fertility has been little appreciated heretofore. Of course, market facilities and commercial influences reflect this development and at the same time encourage it, so that cotton farming has come to be the accepted form of industry.

LABOR.

The farm labor of the county is both white and colored. A large part of the farm work is done by the operators and their families, but the greater part of the cotton picking is done by colored la-

borers—men, women, and children. A class of laborers known as croppers[1] or "half hands" are generally of the white race, but a considerable number are colored. Croppers are employed in handling more than 20 per cent of the cotton of the county. (See Table IV.) The transient labor is practically all colored and remains in the towns, except during the chopping and picking seasons. Cotton picking is done almost entirely by contract, the price paid per hundred pounds being determined largely by the quality and yield of cotton.

AGRICULTURAL DEVELOPMENT.

Ellis County was organized in 1894, being formerly a part of Navarro County. The first settlement was made near Forreston about 1844. The early settlers came chiefly from Tennessee, Georgia, and the Carolinas, and more than half of the present population of nearly 54,000 is directly descended from these emigrants. There are some foreign-born citizens and their descendants in the county, Bohemians, Hungarians, and Germans comprising the greater part of this element. There is a considerable number of negroes in the county, mostly confined to the towns. Prior to 1865 practically the only enterprises were the production of cattle and sheep. Wheat was first produced about 1850, but did not become important until about 1880. During this period grain crops were raised on the upland and cotton made its first appearance in the bottoms along the streams. All crop land was under fence until 1901, when the fence law was repealed. Alfalfa was first raised in the bottom of Mustang Creek in 1890 and in 1896 it was produced in the Elm Thicket section.

A very little cotton was produced in the county before 1860. The first gin in operation consisted of a handmade two-roller outfit run by hand. This was superseded by a power gin about 1881. From the very beginning of the production of cotton the acreage of this crop has increased, entirely supplanting the range at the present time. The boll weevil caused some damage in Ellis County about 1903, following which considerable more attention was given to feed and grain crops. From this period to the present, however, there has been little damage to cotton from this source.

Table I shows the trend of development in Ellis County from 1850 to the present. The area of the county is 587,520 acres, of which only 2,600 acres were improved land in 1850. From that date to the present the development of crop farming has been rapid and uniform, 446,194 acres being improved in 1910. Cotton has held the largest place in the cropping system, developing from 52,172 acres in 1880 to 274,666 acres in 1910. Corn has made advances parallel with

[1] For definition of cropper see p. 2.

cotton, except that the 1910 period shows a marked decrease in acreage, but at no time has this crop equaled cotton in extent. Oats and wheat have increased markedly in acreage, but these have likewise fallen off in extent in the 1910 decade.

TABLE I.—*Agricultural statistics for Ellis County, Tex., from the reports of the United States census, 1850–1910.*

	1850	1860	1870	1880	1890	1900	1910
Total area of county (acres)							[a] 587,520
Acreage of improved land	2,600	23,636	28,201	201,506	303,910	394,968	446,194
Cotton:							
Acreage	(b)	(b)	(b)	52,172	103,629	197,828	274,666
Production (bales)		359	2,960	18,956	42,701	91,298	77,141
Corn:							
Acreage	(b)	(b)	(b)	42,899	57,568	99,798	62,573
Production (bushels)	28,744	119,918	312,843	577,121	1,715,798	3,203,600	915,267
Oats:							
Acreage	(b)	(b)	(b)	5,533	13,265	27,232	2,061
Production (bushels)	1,315	31,591	16,076	153,527	299,444	1,014,750	26,617
Wheat:							
Acreage	(b)	(b)	(b)	18,500	11,260	34,264	368
Production (bushels)	945	88,345	11,943	176,215	103,847	503,730	1,914
Number of—							
Horses	309	7,803	7,387	12,942	14,992	13,033	9,796
Mules			776	2,758	5,463	11,620	14,472
Dairy cows	937	7,604	3,892	8,809	10,639	9,783	8,054
Other cattle	1,752	51,761	21,211	29,981	24,400	19,889	7,749
Sheep	259	17,539	3,007	1,857	818	907	1,174
Swine	2,858	10,947	8,171	15,097	26,347	58,756	20,214

[a] Bureau of Soils, U. S. Dept. of Agriculture. [b] No data.

Horses increased in number from 1850 to 1890, but from 1890 to the present the number has fallen off, the horses being replaced by mules. The latter were noticeable first in 1870 and have continuously increased to the present. The total of mules and horses has increased each decade to 1900, since which time the number has remained at about 25,000 for the county.

Dairy cattle have never been numerous in the county, but range or beef cattle became quite numerous in the 1860 decade. From that time to the present beef cattle have decreased, the range being taken up by crop farming. Sheep, while not numerous, reached their maximum at about the same time as beef cattle and have generally declined since. Swine, never very prominent, reached their maximum in the 1900 decade.

The foregoing data show that stock raising on an extensive scale has been supplanted by crop farming since 1860. Practically all the land capable of tillage has been brought under cultivation, and cotton holds the important place at the present time.

REAL ESTATE VALUES.

Since Texas became a State all public lands within her boundaries have remained under State control. Title to land before the Mexican War was derived from the Spanish and Mexican Governments.

In consequence, all surveys were made using Spanish units of measure, the square league, "legua" (4,428.4 acres) and "labor" (174 acres), being the common measures of area. It was the custom in making surveys to use natural lines such as streams or coast lines as bases, giving the land units frontage on these natural features. Consequently there is little regularity either in shape or size of the various units. Land lines, therefore, have no relation to magnetic north and south (except in the Panhandle section of Texas).

Tracts of land acquired as Spanish grants have since been subdivided and sold in smaller area at prices as low as 50 cents per acre. Texas public land has been sold as low as $2.50 per acre. However, as the development of cotton farming took place land values advanced rapidly. The average selling price of land as represented by this survey of 115 farms of Ellis County was $139 per acre in 1914. This price was arrived at by asking each farmer what he considered a fair commercial valuation for his land with its improvements, and was verified by prices received in local sales of farms.

The census valuation of lands for Ellis County as a whole was, for 1910, $59.90 per acre. The wide discrepancy between this figure and that reported for the farms visited in this study, is due to several causes. In the first place, census values are usually about the same as assessed valuations, which are usually less than half the current sale values. The census figures also apply to the entire county, while the figures of the survey apply to a selected area in which land values are above the average. Furthermore, during the 4½ years since the census values were obtained, land had risen markedly in value. A comparison of census data for 1880 with those for 1910 shows that on the average for this 30-year period land values in Ellis County increased at an average annual rate of 6 per cent. During the last decade of this period the total increase was more than 100 per cent.

A considerable proportion of these lands are farmed by share tenants. The net rental income from lands thus rented averages $4.80 per acre, which is 3.5 per cent of the average valuation of $139 per acre. From this it might appear that these lands were overvalued, but when the fact is taken into consideration that they were increasing in market price, this appears not to be the case. The owner of land obtains his profits not only from operating income, but also from increase in market price of the land. We have already seen that the latter source of profit has averaged 6 per cent annually for 30 years past. When this is added to the 3.5 per cent profit from operation, there is a total profit on the investment of 9.5 per cent. Local land values appear, therefore, to be justified from the standpoint of the investor. He is, in fact, making a fair profit on his investment, and it is this fact, in part, that gives these lands their mar-

ket value. Similar conditions prevail in other good agricultural areas, especially in the Middle and Western States.

That farm lands in this county will continue to increase in price at these high rates for an indefinite period is hardly to be expected. However, they may continue to do so for some time. During the last census period the area of crops in the United States for which acreage is reported increased only 9.9 per cent, while population increased 21 per cent. During this same period the prices of farm products increased on the average 67 per cent. Further increase in the market price of farm products will have a tendency further to increase the price of farm land.

Another reason why the price of farm land is usually such that the operating income from it is only 3½ or 4 per cent, lies in the fact that the ownership of land is distinctly advantageous for many reasons. Because of the fact that investment in land represents an almost absolute security from loss of capital, owners are willing to accept a low rate of interest on their investments. The independence of the landowner is worth much to the average man. The land furnishes a permanent abiding place—a home—with all that this means to the average citizen. Men will therefore pay a relatively higher price for farm land than they will for most other investment properties bringing the same income.

In Table II are shown the average prices of land operated under three types of tenure. It will be noted that the income per acre to owners where land is rented for cash represents but 2.4 per cent on the investment of the owners, but as only a very small portion of the crop area of any farm in this group is rented for cash, these returns do not represent actual incomes from farms. The average percentage return on the investment for the 115 farms included in these studies,[1] when converted to a uniform basis of operation for comparison, is 6.3 per cent.

While the working owners make a very satisfactory income on the investment, the landlords whose farms are operated by tenants are satisfied with a very much smaller return. They do not expect so large returns because of the security of investment and expected profits from advances in land prices in the future. The satisfactory incomes of owners cover all the risks of farm operation, while the returns to landlords from their land covers only a very small portion of the risk, the greater part being borne by the tenants.

[1] Five of the 120 records taken were discarded. Only 114 records furnished complete records on cost of production. In some of the tabulations only 109 records were used.

TABLE II.—*Value of land operated under different tenures and income to the owners of the land, Ellis County, Tex., in 1914.*

	Value per acre.	Gross income per acre for owner.	Net income per acre for owner.	Per cent return on investment of owners.
37 working owner farms	$151	$26.40	$11.89	5.9
24 share rent farms	137	6.18	4.80	3.5
18 share-cash rent farms	141	6.42	5.04	3.6
18 share-cash rent farms (cash rented land)	141	4.82	3.44	2.4

From the standpoint of the tenant or other individual who has a limited amount of capital, but who desires to become a landowner, it is very important that a close approximation of the earning value of the land be known. When this value is known it is possible for the prospective buyer to determine what portion of the cost price must be paid at the time the land is bought and how much may be met from the earnings of the land. It is, however, highly important that the tenant farmer should look forward to the time when he can make a sufficient first payment on a farm to render it possible for

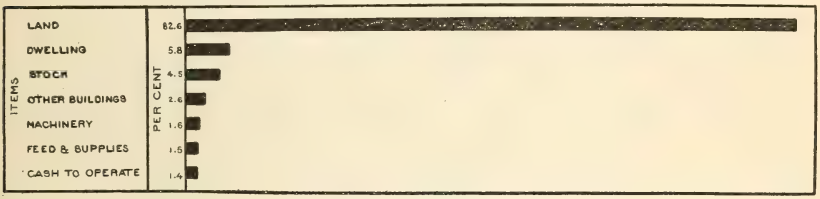

FIG. 3.—Proportionate capital invested in various items (average, 115 farms, Ellis County, Tex.).

him to become an owner. Ownership is greatly to be desired because of its effect upon industry and citizenship. The sense of possession and the inducement to save in order to own a home warrant extraordinary effort if a considerable initial payment can be made and reasonable rates of interest can be obtained.

The graph (fig. 3) shows the average distribution of capital at the present time as indicated by the records of 115 farms of Ellis County. Land represents 82.6 per cent of the total farm investment. Dwellings represent 5.8 per cent, while other buildings such as barns, tenant houses, sheds, etc., represent 2.6 per cent of the total. The remaining working capital, consisting of stock, machinery, feed and supplies, and cash to run the business, amounts to 9 per cent of the investment.

NORMAL CONDITIONS.

It is appreciated that definite conclusions regarding farm business can not be drawn unless practically all conditions are near the average for a considerable period of years. The records of this survey

cover the farm business for the calendar year 1914. Two factors affecting results were not normal, namely, the price received for cotton and the yield of oats.

To overcome the discrepancy in the price of cotton, the average price received for the 5 years previous to 1914 was obtained from each farmer. The average of these data shows that under normal market conditions the price received was 11.2 cents per pound. Therefore, in all calculations where receipts from cotton are considered, the average 5-year price per pound has been substituted. This price is far below that now prevailing. Present prices are due to a great war, and can hardly be expected to continue when conditions have become normal again.

On account of drought conditions during the early summer of 1914, the oats crop was practically a failure. More than two-thirds of the oats planted for grain were cut for hay and very low yields were obtained for this feed. Since it is impracticable to determine increased labor and other costs due to increase in yield as well as increased returns from this enterprise, no definite conclusions are drawn concerning oats. However, since oats occupied only 6.9 per cent of the total acreage in crops, it is thought that this discrepancy will not vitiate the general results of the survey.

Comparison with census data and consistent statements from farmers indicate that practically all other important factors of the farm business were normal during the year 1914.

TENURE.

The tenure problem is an acute one in Ellis County, as it is in Texas generally. A complete analysis of the problem would require a large amount of information concerning each tenure system. Since records were obtained from only 114 farms, when these are grouped according to tenure there are not enough farms in each system to make fair averages.

Seven more or less distinct tenure systems[1] were encountered in the survey, the number of farms in each group being as follows: 37 owner-operators, 11 owners-additional, 16 owners with cropper labor, 5 owners-additional with cropper labor, 24 share renters, 18 share-cash renters and 3 independent croppers. These make a total of 114 farms on which tenure and cost tabulations were made. The owner-operator farms and the owner-with-cropper-labor farms might each be further subdivided, since operators were found in each of these groups who rented out a part of the land owned. However, in the data here given the latter classification is not con-

[1] For definitions of the tenure systems see p. 2.

sidered, the land rented out being eliminated entirely from the business of the farms operated by the owners.

No farms were encountered in this survey which were rented entirely for cash, all rented land in cotton being operated on the share basis. This condition may be accounted for as follows: A glance at the curve in figure 9 (p. 32) shows that from 1903 to 1914 three crops of cotton were failures or nearly so, namely, those of 1905, 1907, and 1909, which is a failure once in four years on the average. Where there are frequent failures, and where there is such a wide variation in yield (310 pounds in 1906 to 125 pounds in 1909), as indicated by the curve above referred to, it is impossible to establish any cash rental value that will be equitable to both landlord and tenant. Thus it has come about that practice has established that land rented for cotton is on the basis of one-fourth share to the landlord. By this system there is less hardship on either the landlord or tenant from a failure of the crop, a matter over which neither has any control. Where a large yield is secured, the landlord makes a high rent and the tenant gets proportionately high returns. When the yield is poor, both share the misfortune, but the tenant's rent is low in proportion to his returns.

The three leading tenure systems, i. e., owner-operator, share renter, and share-cash renter, were found on a sufficient number of farms to justify the drawing of certain conclusions from their averages.

TABLE III.—*Percentage of crop area in different crops under different tenure systems (79 farms, Ellis County, Tex., in 1914).*

Tenure system.	Number of farms.	Per cent of crop area in specified crops.					Per cent of crop acreage in second crops.
		Cotton.	Corn.	Oats (grain).	Oat hay.	Other crops.	
Owner wage	37	67.2	15.2	2.7	5.2	9.8	1.3
Share renters	24	73.7	14.9	2.6	4.6	4.3	.6
Share-cash renters	18	79.0	12.1	1.2	2.7	5.1	.6
All farms	79	72.5	13.3	2.8	3.8	6.5	.8

Table III shows the percentage of crop area in the principal crops under these three leading tenure systems. It is seen that the owner farms have less cotton and more feed crops than farms under either of the tenant systems. Further, the table shows that the owners grow second crops slightly more than do the tenants. On the tenant farms all cotton is share rented and a part or all of the grain and feed crops on the share-cash rent farms is cash rented.

Table IV shows that of the 9,781 acres of cotton produced on these farms, 40.1 per cent is raised by owners with wage labor, 22 per cent

by owners with cropper labor, and 37.9 per cent is raised on share-rented land by wage labor.

TABLE IV.—*Acreage and yield of cotton under different tenures (114 farms, Ellis County, Tex., in 1914).*

	Owner-wage cotton.	Share-rent cotton.	Cropper cotton.	All cotton.
Acreage	3,922	3,707	2,152	9,787
Per cent of total	40.1	37.9	22.0	100.0
Yield per acre (pounds lint)	257	229	231	241

The owner-wage cotton gave the highest yield per acre—257 pounds of lint. Cropper cotton yielded 231 pounds and the share-rented cotton produced 229 pounds of lint per acre. The fact that cotton raised by owners with wage labor yielded best is accounted for partly by the fact that the crop received closer oversight than that produced by cropper labor. Further, the owned land is slightly better in quality than share-rented land, the estimated rent of owner-operated land being $5.19 per acre, while that of rented land is $4.92 per acre.

Table V shows the cost of producing cotton under different tenures and under different labor systems. On 69 farms where owners produce cotton with wage labor, the cost is 8.2 cents per pound. The cost of the owner's half of the crop produced by cropper labor on 24 farms is 9.4 cents per pound, while the cropper's half costs the cropper only 6.8 cents per pound. On 49 farms where cotton land is rented on shares the cost to the landlord for his share of the crop is 8.1 cents and the cost to the tenant for his share is 8.5 cents per pound. On these 49 farms four landlords received one-third of the cotton produced by the tenants, while 45 landlords received one-fourth.

TABLE V.—*Average cost of cotton per pound under different tenures and labor systems (114 farms, Ellis County, Tex.).*

	Owner-wage.	Share-rent wage.			Cropper.			Average of all cotton.
		Landlord.	Tenant.	Average.	Owner-operator.	Cropper.	Average.	
Number of records	69	49	49	49	24	24	24	142
Cost per pound (cents)	8.2	8.1	8.5	8.4	9.4	6.8	8.1	8.3

From the standpoint of cost of production it is seen that the customary rental of one-fourth of the cotton is reasonable and fair. In the half-and-half division of the cotton produced by cropper labor the heavier cost falls on the owner or operator, the difference being 2.6 cents per pound. The margin of profit of the owner's share of

cropper cotton is approximately 1.8 cents per pound, while the margin of profit to the cropper is 4.4 cents per pound.

Two reasons may be cited why owners are willing to stand a higher cost for their share of the cotton raised by cropper labor than the cropper's share costs the cropper. The owners have the alternative of raising cotton with wage or hired labor, or they may employ croppers and allow them half the crop produced as wages. In the first case, the owner must take all the risks in producing the crop, whereas, in the second case, the cropper shares the risk equally with the owner. Further, under the wage system the owner must provide all the man labor and oversee it, whereas with croppers the latter must furnish and oversee the hired labor.

In Table VI, 79 of these farms are grouped according to the capital of the operator. It is a striking fact that every operator with less than $4,000 capital is a tenant, while every one with more than this is an owner; and this in spite of the fact that tenants with an average capital of only $1,200 make nearly as much as owners with $10,000, while tenants with $2,500 invested make distinctly greater incomes than owners with an investment four times as great. These figures indicate clearly that an operator *with small capital* can make a much better income as a tenant than as an owner. Similar results have been found in all farm-management surveys, made in all parts of the United States.

TABLE VI.—*Relation of capital invested by farm operator to income of the operators of owner and tenant farms (79 farms, Ellis County, Tex., in 1914).*

Operator's capital.	Owner farms.				Tenant farms.				
	Number records.	Crop acres.	Average capital.	Farm income.	Number records.	Crop acres.	Average capital.		Farm income of tenant.
							Landlord.	Tenant operator.	
$516 to $1,966					28	91	$13,453	$1,212	$751
$2,015 to $3,237					14	131	20,798	2,375	1,157
$4,709 to $13,665	15	60	$10,112	$850					
$14,203 to $19,548	17	89	17,088	1,398					
$21,106 to $41,360	5	141	31,100	2,278					

From the results shown in Table VI, it would seem probable that the groups of owners having an average capital of about $10,000 could do much better financially if they would rent large farms and operate as tenants. But not a single operator with $4,000 or more capital is doing this. Since, theoretically at least, they could make much larger incomes as tenants, there must be very important reasons why they choose to operate as owners of smaller farms. Generally speaking, wherever surveys of this kind have been made in this coun-

try, just as soon as the tenant accumulates enough capital to make a fair living as an owner, he passes into the owner class, often sacrificing two-thirds of his income in doing so. Table VII shows the corresponding facts for a survey made in Chester County, Pa. In the fourth capital group ($3,000 to $5,000), the majority have become owners, in spite of the fact that the average income of owners in this group is only $521, while that of tenants with similar investments is $1,574. Only six operators with as much as $5,000 capital choose to remain tenants, and not one with more than $9,000. Why, then, do they choose ownership with smaller incomes? The answer to this question lies at the very foundation of rural citizenship in this country.

TABLE VII.—*Sizes of owner and tenant farms and amount of income on 502 farms in Chester County, Pa.*

Amount of capital.	Owners.			Tenants.		
	Number of farms.	Average area.	Average income.	Number of farms.	Average area.	Average income.
		Acres.			*Acres.*	
$1,000 and less				19	42.2	$424
$1,001 to $2,000	3	19.5	$122	46	94.7	640
$2,001 to $3,000	11	21.7	223	34	123.9	815
$3,001 to $5,000	33	37.1	521	19	147.3	1,574
$5,001 to $7,000	60	57.7	819	4	162.8	2,578
$7,001 to $9,000	67	71.1	994	2	136.0	3,276
$9,001 to $11,000	55	94.2	1,169			
$11,001 to $14,000	66	109.6	1,641			
$14,001 to $17,000	47	123.4	2,035			
Over $17,000	36	163.0	2,583			

In the first place, a moderate working capital of, say, $10,000 would suffice for the operation of a very large farm. It is only the exceptional man who is capable of operating such a farm. On a moderate-sized farm the average farm family can do most of the work. As the size of the farm increases there must be increasing dependence on hired labor, which is growing more and more unreliable and difficult to obtain. Most men prefer a smaller farm business in which labor difficulties are much less troublesome. Men who have large holdings in farm land nearly always lease them out in relatively small tracts rather than undertake to operate a single large business unit.

While the difficulty of securing satisfactory labor for the operation of large farms is one of the reasons why men of moderate capital choose to operate as owners of medium-sized farms rather than as tenants on large farms, it is by no means the most important reason. The owner who operates his own farm is absolutely his own boss. He enjoys economic independence. No one can tell him what he shall plant. He is in no danger, provided he keeps out of debt, that anyone shall tell him to move on to make place for somebody else.

He does not have to dicker with anyone about the amount of rent he must pay, or how long he may stay. His home is his castle, in which he is supreme. The average red-blooded American is ready to sacrifice much for these advantages; and who shall say they are not worth what they cost?

But these personal aspects of the case are not the whole story. There is a broader aspect of national import. The tenant farmer, because he is not a permanent resident of the community, takes little interest in the local church, the school, or the condition of the public roads. He does not cheerfully contribute to their proper upkeep. He is not even deeply interested in good local government, because he feels that it is not his concern. He looks to the landowner for the performance of civic duties. He is, in fact, a much less valuable member of society than the farmer who owns the land he tills.

Farm-management studies show unquestionably that the young farmer just starting out with small capital should, for purely financial reasons, operate as a tenant on a moderate-sized farm rather than as owner on a mere garden patch; but they also show that because of the tremendous advantages of ownership, practically all American farmers become owner-operators just as soon as they have acquired sufficient capital to enable them to do so without carrying an insufferable burden of debt.

An important and possibly a controlling financial reason for ownership is the calculated profit in the enhanced value of the lands. As has been shown, this is an important consideration to the large landowner who rents his land for a comparatively small return in yearly income and who receives a satisfactory return in the advance in values of farm property. In Table VI, for instance, the average farm income on owner farms valued at $4,709 to $13,665 is only $850, compared with the farm income of $1,157 by the tenant operating on a capital of $2,015 to $3,237. If we take the average of say $8,000 for the value of the farm in the first class and calculate the enhanced value on that at the rate of 6 per cent per annum, as is warranted in the previous exhibit of advance in value of farm property over a period of 30 years, the result will add $480 to the $850, or a gross income of $1,330 for the farm owner, compared with an income of $1,157 for the tenant. Undoubtedly the expectation of increased value in the farm, based upon the experience of preceding years, is an additional reason, besides those already recited, for ownership, in spite of apparent loss of income on the year's operation.

In the one case he spends his income and makes no provision for his children or for his own old age. In the other he has laid by his income in a farm that insures a comfortable living when he is too old to work and provides a start in life for his offspring. It is decidedly

the exceptional man who finds it more advantageous to remain a tenant after he is able to become the owner of a good farm, and it is fortunate for the Nation that this is so.

There is another reason why, from the standpoint of national economy, tenant farming as a general proposition is not desirable. On the farms included in this study, the records show that notwithstanding the larger profit of the tenant with small capital, compared with the profit of the small owner, the records show also, as has been recorded, that the owner farms have less cotton and more feed crops, and consequently the agriculture under ownership is better balanced and more stable. The records show also that the owner farms produce a larger yield per acre. It is seen that ownership induces better cultivation, maintains soil fertility, and increases substantial values. The lesson to be drawn from the study in this respect is that while it is unwise to purchase high-priced land upon small payment at a high rate of interest, ownership is to be encouraged when there is a reasonable expectation of accomplishment.

HIRED AND CROPPER LABOR.

Owners have two alternatives with respect to labor: They may hire labor by the day, month, or contract, or they may employ cropper labor. Table VIII shows the relation of the croppers to the owners or operators on farms of different sizes. On farms having 80 acres or less of crops, averaging 62.5 acres per farm, 9.2 per cent of the land is worked by cropper labor. As the farms increase in size, more cropper labor is employed until in the group of farms of 121 acres or more 22.5 per cent of all land is worked by cropper labor. The average amount of land worked by croppers in the region is 18 per cent of the total crop area. The acreage of cotton produced by cropper labor, however, is 22 per cent of the total. The fact that there is a considerable increase in amount of land worked by croppers as size of farm increases is accounted for by the fact that the operator is not able to give proper oversight to the larger acreage where wage or hired labor is employed; further, the responsibility of securing extra labor for chopping and picking is transferred to the croppers.

TABLE VIII.—*Relation of size of farm to percentage of acreage farmed by wage and cropper labor (114 farms, Ellis County, Tex., in 1914).*

Size of crop area.	Number of farms.	Average size crop area.	Per cent of total crop area worked by wage labor.	Per cent of total crop area worked by cropper labor.
80 acres or less	37	62.5	90.8	9.2
81 to 120 acres	39	100.1	85.2	14.8
121 acres and more	38	198.9	77.5	22.5
All farms	114	117.5	82.0	18.0

The cropper, or "half hand" as he is often called locally, is a laborer rather than a tenant. He is furnished with a house and small garden patch; often he is permitted to keep a cow or horse for his own use. A definite acreage is set aside by the operator on which the cropper grows the crops, furnishing all the man labor for this acreage. The operator furnishes all power and machinery for the cultivation. When the crops are gathered, the operator and cropper share equally in the division, each paying for his share of the ginning.

The value of the cropper's labor, together with the cost of ginning his share of cotton, averages $9.56 per acre at current wage rates. His share of the crops, which is what he receives for his labor,

FIG. 4.—Type of tenant farmstead, Ellis County, Tex.

amounts to $15.34 per acre, which leaves a profit to the cropper of $5.78 per acre.

TABLE IX.—*Distribution of cropper expenses and receipts, and net income (40 croppers, 24 farms, Ellis County, Tex.).*

Number of farms	24
Number of croppers	40
Acres per cropper	59
Number of days miscellaneous productive labor per cropper	28
Cropper's receipts from crops	$860
Cropper's receipts from miscellaneous labor	42
Cropper's total receipts	902

Value of family labor per cropper	$179
Cost of hired labor per cropper	73
Interest on cash to operate per cropper	13
Ginning cost per cropper	84
Total expenses per cropper	349
Net income per cropper	553
Estimated value of cropper's own labor	228
Profit to cropper over value of his labor	325

Table IX shows the distribution and summary of the cropper's expenses and receipts. The difference between cropper's receipts and expenses amounts to $553, which he receives for his labor. Deducting the average estimated value of the cropper's labor at current wage rates his profit is $325. He receives this amount partly to

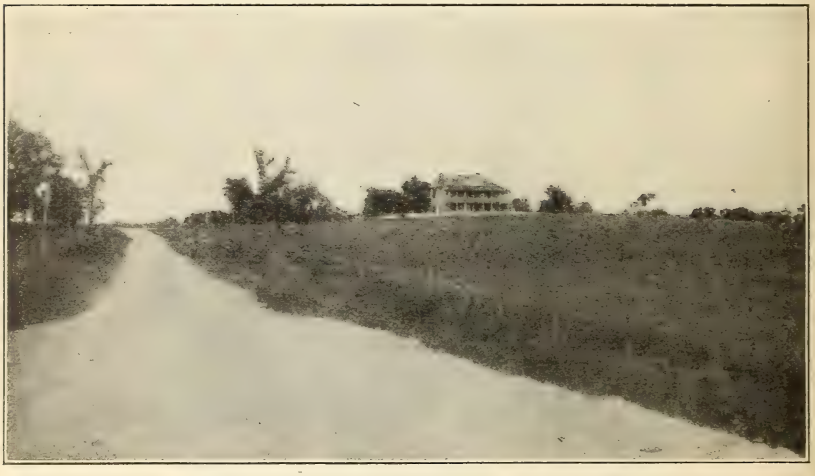

FIG. 5.—Farm residence of a large land owner.

cover risk on his share of the crop, and partly because he requires less supervision than the hired laborer.

In figure 4 is shown a farmstead typical of rented farms in Ellis County. Figure 5 shows a representative owner's residence.

CONVERTED TENURES.

In order to have a sufficient number of farms in each of several groups to determine the effect of various factors on farm practice, efficiency, etc., it was necessary to eliminate the factor of tenure after the foregoing tables had been compiled. This was accomplished by eliminating all transactions between landlord and tenant. All farms not operated by their owners were converted to the basis of working owners by charging the tenants with the value of the

land rented. All expenses were charged and receipts were credited to the operators as though they owned the land. All calculations hereafter mentioned in this bulletin treat of the farms as though operated by their owners, thus eliminating the factor of tenure. By this method, labor incomes, per cent return on investment, and other standards of efficiency, are made comparable for all farms.

TYPE OF FARM.

Stock holds a very minor place in the farm practice of Ellis County. Only 9 per cent of the farm area is devoted to pasture, 87 per cent being in crops, and the remaining 4 per cent waste land occupied by roads, stream channels, bluffs, etc. Fifty per cent of the farms have more than 90 per cent of the farm area in crops and 90 per cent have more than 70 per cent of the farm area in crops. Twenty-one per cent of the farms have no pasture land and 73 per cent have less than 10 per cent of their area in pasture. Crop farming, therefore, is the major portion of the farm business.

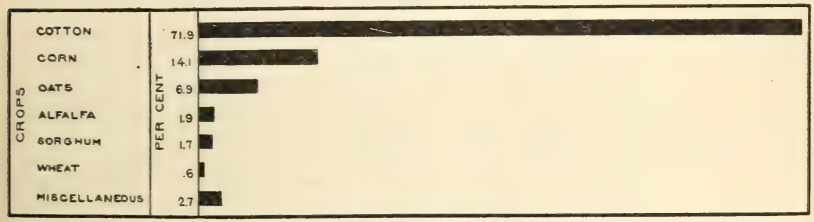

FIG. 6.—Proportion of crop land devoted to the principal crops (115 farms, Ellis County, Tex.).

Figure 6 shows graphically the proportion of the crop land in the principal crops. It is seen that cotton occupies 71.9 per cent, or nearly three-fourths of the crop area, corn 14.1 per cent, oats 6.9 per cent, alfalfa 1.9 per cent, wheat 0.6 per cent, and miscellaneous crops 2.7 per cent. The miscellaneous crops consist of the following: sorghum, milo maize, kafir corn, Sudan grass, Johnson grass, sweet potatoes, and a few others of very minor importance.

Sixty-seven per cent of the farms have more than 70 per cent of their crop area in cotton, while only 4 per cent have 40 per cent or less of their crop area in cotton. Five per cent of the farms have no corn. Fifty-eight per cent have from 11 to 20 per cent of their crop area in corn, and only 1 per cent have more than 30 per cent of their crop area in corn.

Eighty per cent of the farms have no oats for grain and 36 per cent have no oat hay. Thirty-one per cent have no sorghum, and 99 per cent have less than 10 per cent crop acreage in this feed crop.

Ninety-one per cent of the farms have no wheat and 93 per cent have no alfalfa.

The case is somewhat similar with feed stuffs. Cotton growers too often depend on buying them, when they could produce them on the farm with little extra expense. Even where cotton is the only farm product that can be relied on as a source of income, it is undoubtedly good practice to produce the food and feed required on the farm as largely as possible, and the best farmers do so.

Because of the time required to obtain from the farmer the details necessary to an analysis of the farm business, it is not practicable at the same time to get a financial account of what the farm furnishes toward the family living. The latter is a separate study. No such study has been made in Ellis County, though one has been made in McLennon County, where conditions are somewhat similar. In this region, as in all regions devoted to a one-sided system of farming, farmers often neglect the opportunity they have to produce an abundance and variety of food. As a result the family lives largely on materials bought at the stores. This is one of the evils of a one-crop system. Even if it were true, as many cotton farmers claim, that they can raise cotton and sell it and buy fruits, vegetables, and poultry and dairy products cheaper than they could raise them, the fact remains that unless they are produced on the farm the family will not have them in abundance, and what they do buy is not of as high quality as that produced at home.

TABLE X.—*Percentage of total receipts from different sources in 1914. (115 farms, Ellis County, Tex.)*

	Per cent.
Cotton	86
Corn	2
Other crops	3.4
Stock	5.6
Increase feed and supplies	1.3
Miscellaneous	1.6

Table X shows the sources from which the income is derived. With 86 per cent of the receipts from cotton, it is clear that cotton is the all-important enterprise of every farm.

Alfalfa was found on 8 of the farms studied. The yield of cotton per acre on these farms was greater than on farms where no alfalfa was produced. Indications seem to point to the future production of larger areas of alfalfa, not to displace cotton, but to increase the yield of cotton and also the net returns of the farms. There is no doubt that the production of alfalfa will greatly improve the fertility of the soil. It is unfortunate that there are not more farms in the alfalfa groups in order that more definite conclusions might be drawn.

SIZE OF BUSINESS.

In the tabulations which follow it is shown quite conclusively that the farm income increases as the size of the farm business increases. But it should not be inferred from this that all farms should be large farms. Many men who succeed fairly well on small or moderate-sized farms would fail utterly on farms so large as to require a great deal of hired labor. Many men who can themselves work efficiently can not direct efficiently the work of others. One reason why large farms are generally more profitable than small ones is that the men who run them are men of large ability. When a man of small business capacity undertakes to manage a large farm he loses money for the owner.

In general, it is desirable that every farmer have as large a farm as he can manage efficiently.[1]

In practically all the tabulations relating to size of business, records from 115 farms are used, being divided according to size into three groups of 36, 40, and 39 farms, respectively. However, in some tabulations where costs were involved only 114 farms are used.

RELATION OF SIZE OF BUSINESS TO DISTRIBUTION OF INVESTMENT.

There is scarcely any difference in the price of land per acre between the small and the large farms. However, there is a slight decrease in the amount of working capital per acre utilized in the larger farms. On farms of approximately 60 acres of crops the working capital (work stock, equipment, cash required to run the farm, etc.) amounts to about $20 per acre, while on farms of approximately 200 acres of crops the working capital amounts to less than $14 per acre. This is due to the more efficient utilization of the stock and equipment on the larger farms.

The value of buildings per acre is also slightly less on large farms than on those of smaller area, although the value of buildings per farm is greater on the larger farms. The average value of dwellings

[1] "The minimum efficient unit" in agriculture is a farm of sufficient size and so organized as to give full employment at productive labor to the farm family. The farm may be any amount larger than this, provided the operator has sufficient ability to make the larger business efficient, but there are very distinct disadvantages if the farm business is smaller than the most efficient unit as above described. When such is the case, the farm family does not have the opportunity to exert its full earning power.

The fact that the minimum efficient unit in farming is relatively very small as compared with most other industries is the most attractive feature of farming as a business. Because of the small size of this unit economic independence is fairly easy of accomplishment and many prefer independence with a moderate competence to independence with a very small chance of pronounced success.

The ideal size of farm is somewhat larger than the minimum efficient unit. It is such as to permit a high standard of living and the education of the farm children, but the ordinary family farm with good management will often permit this.—W. J. Spillman, in U. S. Dept. Agr. Bul. 341, p. 54.

on the farms studied is approximately $1,200; the average value of all other buildings, consisting of tenant houses, barns, sheds, etc., is about $550 per farm.

The number and value of work stock increases when the size of farm increases, but not in the same proportion. Farms of 60 acres average slightly more than 3 head of work stock, and farms of 200 acres utilize an average of nearly 8 head per farm. The average value of work animals on all farms is $135 per head (1914).

The average value of cattle is $141 per farm. Other productive stock, consisting of about 75 chickens, 3 to 5 hogs, turkeys, ducks, guinea hens, etc., are valued at approximately $100 per farm.

RELATION OF SIZE OF FARM TO TYPE AND YIELD PER ACRE.

The proportionate acreage of cotton increases slightly as the size of farms becomes larger and a slightly less proportionate area of corn is produced on the larger farms. The other miscellaneous crops show no regularity of increase or decrease as size of farm increases.

Size of farm has a slight effect on the yield of cotton. Thirty-six farms of 80 acres or less, averaging 62.5 acres, make an average yield of cotton of 256 pounds of lint per acre. Forty farms from 81 to 120 acres in size make an average yield of 247 pounds of lint per acre. Thirty-nine farms of more than 121 acres, averaging 188.9 acres, make an average yield of 233 pounds of lint per acre. The average yield of cotton for all farms in the survey is 241 pounds of lint.

Size of farm apparently has no effect on the yield of other crops. The average yield for all corn is 25.6 bushels per acre; for sorghum, 2.8 tons; and for alfalfa, 2.51 tons.

EFFICIENCY OF HORSE LABOR.

Table XI shows the relation of size of farm to the efficiency of horse labor. As the size of farm increases, the number of days of productive labor that each animal performs annually increases, those on the small farms accomplishing 60.3 days of productive work while on the large farms each animal works 79.1 days. The figures in the column headed "Acres per horse" are obtained by dividing the number of crop acres by the number of work animals per farm. It is seen that the work stock accomplish considerably more work on the large farms than on the small ones. At the same time there is very little difference in the amount of labor performed on each acre, as indicated in the column showing "Horse days per acre."

TABLE XI.—*Relation of size of farm to efficiency of horse labor (114 farms, Ellis County, Tex.).*

Size of crop area.	Number of farms.	Average size of crop area.	Horse days per horse.	Acres per horse.	Horse days per acre.	Cost of horse labor per crop acre.	Cost of work stock, per day of labor.
80 acres or less	37	62.5	60.3	18.5	3.25	$5.47	$1.68
81 to 120 acres	39	100.1	66.7	20.6	3.22	4.95	1.54
121 acres and more	38	188.9	79.1	25.2	3.14	3.99	1.27
All farms	114	117.5	71.7	22.4	3.19	4.53	1.42

One of the many weaknesses of the one-crop cotton system of farming is shown by the facts brought out in the preceding paragraph. Even on the large farms, where horses are used most effi-

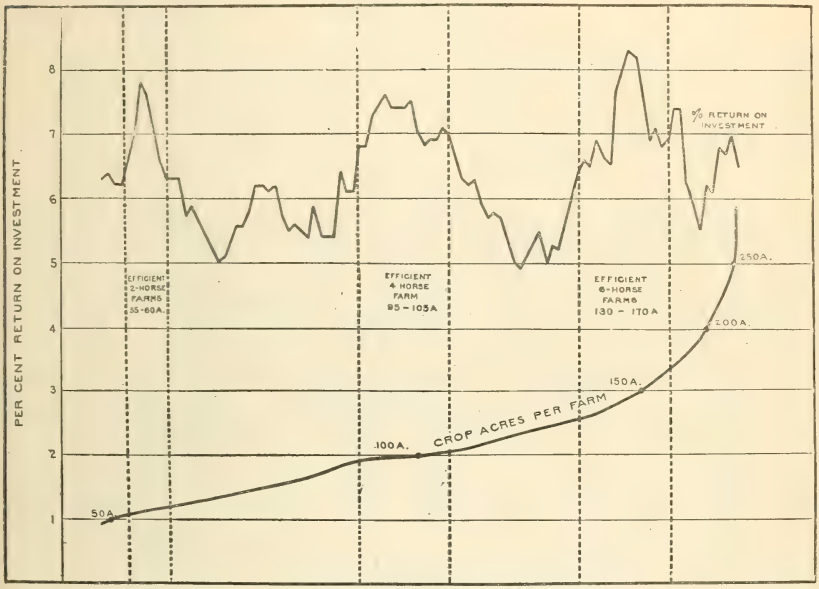

FIG. 7.—Relation of size of farm to percentage return on investment, showing sizes favorable for most efficient use of two horses, four horses, and six horses.

ciently, the average horse works less than 80 days during the year. This adds greatly to the cost of a day's work for a horse. The same difficulty exists to a considerable extent with man labor on cotton farms. There is too much work at certain seasons and not enough at others. It is only when cotton is relatively high priced that such disadvantages are overcome. Unfortunately, in the past there have been many periods when prices fell below cost of production, and this caused great suffering.

The graphic illustration (fig. 7) shows certain relationships between size of farms and returns. It is seen that as the curve repre-

senting size of farm (crop area) rises from left to right, there are three noticeable high points in the curve representing the per cent return on investment for the corresponding groups of farms as represented by the size curve. These high points are caused primarily by the efficient use of teams. It is seen that the first high point of the curve representing per cent return on investment occurs for farms from 55 to 60 acres in extent; the second high point occurs for farms of from 95 to 105 acres and the third high point occurs for farms from 130 to 170 acres.[1]

TABLE XII.—*Appropriate number of teams for farms of different sizes, Ellis County, Tex.*

Crop area.	Number of horses per farm.	Number of records.	Average crop area.	Horse days per horse.	Acres per horse.	Per cent return on investment.
39 to 75 acres	2	11	56	89	29	6.5
	4	13	61	51	16	4.9
75 to 140 acres	4	19	98	72	24	7.1
	6	15	110	60	18	5.1
140 acres and over	4	2	142	131	36	0.2
	6	5	188	83	23	5.9

In Table XII is shown the appropriate number of teams for farms of different sizes as indicated by the curves of figure 11. The first two groups, consisting of 11 and 13 farms, respectively, are composed of the two-horse and four-horse farms from 39 to 75 acres in extent. It is seen that the two-horse farms make much better use of the work stock than do the four-horse farms; the two-horse farms average 56 acres, while the four-horse farms average only 61 acres. It is apparent therefore that farms of 61 acres are not large enough for efficient use of four animals, since on the two-horse farms the equivalent of 29 acres is covered by each animal. The returns of the two-horse farms are 6.5 per cent, while the income of the four-horse farms is only 4.9 per cent on the investment.

The first high point of the curve (fig. 7) representing per cent return on investment is reached when the efficient size for two horses is reached. Beyond this point the farms are too large for efficient use of two horses and not large enough for four animals until farms of about 100 acres are approached. Farms of less than about 50 acres do not make efficient use of horse labor and consequently make low returns, as indicated by the curve.

The same relationships are found between the four-horse and six-horse farms of from 75 to 140 acres in extent as were seen for two-

[1] The curves were constructed by the use of the moving average. The farms were arranged in the order of size from smallest to largest and each point of the curves represents the average of 11 farms, 5 farms on each side of the point being averaged with the farm of that size.

horse and four-horse farms of smaller size above. Four-horse farms averaging 98 acres make good utilization of horse labor and better returns than six-horse farms of the same size group averaging 110 acres (Table XII). It therefore appears that the second high point of the curve (fig. 7) is reached on farms of from 95 to 105 acres where four work animals are utilized. Farms of less acreage are not large enough to utilize four animals efficiently and farms larger than 105 acres are too large, but not large enough for six animals until 130 acres is reached.

Similar conclusions are justified for the third high group (fig. 7), although the size of farms increases so rapidly and not enough farms are included to locate so definitely the exact efficient size of six-horse farms. It appears that six animals should operate not less than 130 acres and not more than 170 acres, the most efficient acreage being doubtless between 140 and 155 acres.

TABLE XIII.—*Relation of size of farm to distribution and summary of receipts, expenses, and income (115 farms, Ellis County, Tex.).*

	All farms.	80 acres or less.	81 to 120 acres.	121 acres or more.
Number of farms	115	36	40	39
Average crop acres per farm	117.55	62.5	100.1	188.9
Crop receipts	$2,755	$1,467	$2,451	$4,256
Increase feed and supplies	49	27	35	85
Stock receipts	118	98	119	137
Miscellaneous	43	40	38	51
Total receipts	2,955	1,632	2,643	4,529
Current expenses	1,170	586	983	1,901
Decrease feed and supplies	47	42	41	58
Stock decrease	7	2	6	14
Depreciation, buildings and machinery	100	74	95	130
Total expenses	1,324	704	1,125	2,103
Farm income	1,641	928	1,518	2,426
Rent and interest on working capital	679	374	643	993
Income above rent	962	554	875	1,433
Per cent return on investment	6.3	6.0	6.4	6.4

RELATION OF SIZE OF FARM TO RECEIPTS AND EXPENSES.

As the size of farm increases, both receipts and expenses increase. The farm income, which is the difference between receipts and expenses, also increases. Table XIII shows the relation of size of farm to various items of expense and receipts, farm income, etc. When the estimated average value of the farmer's labor is deducted from the farm income and the result is divided by the amount of the investment, it is seen that the average return on the investment for all farms is 6.3 per cent, with very little variation with the size of farm. Since the income above rent shows certain regularity with the size of

farm, this factor is used as a measure of efficiency in other tabulations when size of farm does not enter as a disturbing factor.

Figure 8 shows graphically the relation of size of farm to income above rent and percentage returns on the investment. The series of vertical lines (bottom of figure) represents the size of farm in crop acres, each line representing one farm arranged from left to right according to size. The horizontal line at 117.5 acres represents the average crop area per farm for all of the farms studied in the survey.

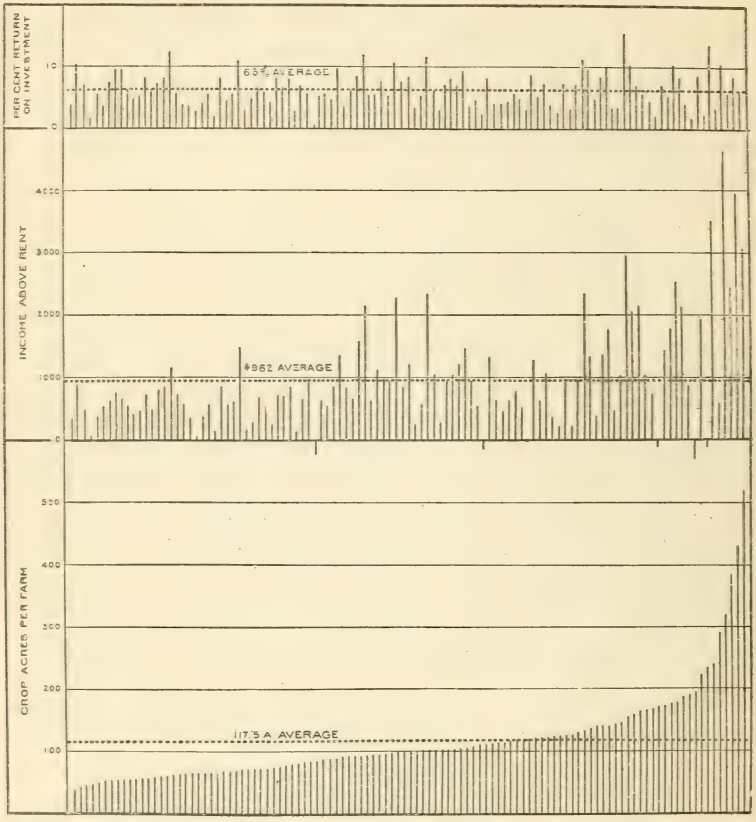

FIG. 8.—Relation of size of farm (bottom) to income above rent (middle) and to present return on investment (top) (115 farms, Ellis County, Tex.).

The series of vertical lines in the middle of the figure represents the income of the same farms shown at the bottom of the figure: the horizontal line (middle) represents the average income above rent for all farms. It is seen that as the size of farm increases (left to right) the incomes become larger, i. e., more of them are above the average line than among the farms of smaller size. Also, it is observed that there are more incomes that fall below the zero line as

the farms become larger. This indicates that as the size of farm increases the opportunities for increased income are greater, and also that the chances for loss increase. In other words, as the size of farm increases, the chances for both large and small incomes increase with the risk, showing greater average returns, however, on the larger farms.

The vertical lines at the top of figure 8 represent the percentage returns on the investment for the same farms, respectively, as represented at the bottom of the figure. The horizontal line (top) represents the average of the percentage returns for all farms, being 6.3 per cent on the investment. It is seen that there are practically as many farms making small percentage returns on large farms as on small ones.

The following conclusions seem justified by the foregoing data concerning size of farm among those studied:

There is better utilization of capital on the large farms than on the small ones. Each dollar of working capital (stock, equipment, etc.) accomplishes more work on the large than on the small farms.

The management is more economical, although possibly not quite as efficient, on the large farms as on the farms of less acreage.

The most efficient size for two-horse farms here appears to be from 55 to 60 acres of crops; for four-horse farms from 95 to 105 acres, and for six-horse farms from 140 to 155 acres.

There is a slightly greater percentage return on the large farms than on the small ones, due to better utilization of labor and lower unit cost of operation.

The total net receipts are greater on the large farms than on the small ones.

The small farms show a greater yield of cotton per acre than the large farms.

Farmers of this region have not generally made the mistake of operating too small an area for the efficient utilization of capital and labor: the smallest farm studied consists of 39 acres of crop land, and the largest 522 acres.

QUALITY OF FARMING.

The curve shown in figure 9 gives the range of yield of cotton per acre from year to year. The yield for 1903 and 1904 was approximately one-half bale per acre, but for five or six years thereafter the yield per acre alternated from high to low, varying from more than 300 pounds of lint per acre in 1906 to 125 pounds of lint in 1909. Again in 1912 the yield of lint was nearly 300 pounds. The straight line across the figure shows approximately the average tendency of

yields from 1903 to 1914. It is seen that this line has a marked downward tendency, indicating that the average yield per acre has gradually decreased during this period.

The variations from year to year in the yield per acre are accounted for by climatic or other conditions, over which the farmers have little control. However, the average downward tendency of the yield per acre is a matter of vital concern to the farmers, and also is a matter over which the farmers can have some influence. It appears certain that the system of farming followed here at present is not self-sustaining. Eventually farmers must either change to some other system, or must so change their practices with the present one as to rebuild the soil.

The forces that determine what system of farming is best in a given locality are so complex that no human agency can tell what system is best until the matter is worked out in practice. In Brooks County, Ga., where the single crop cotton system held sway until yields were reduced to a point that made a change necessary, hogs and peanuts became the farmer's main dependence. But peanuts are not so well adapted to the soils of Ellis County, Tex., and raising hogs for market, as distinguished from raising the home supply, requires careful management on soils that become very muddy in wet weather. It is unwise to try to suggest new systems of farming for this region until a careful study has been made of the system prevailing in other similar regions where this problem has been worked out, if such regions can be found. Such a study is contemplated.

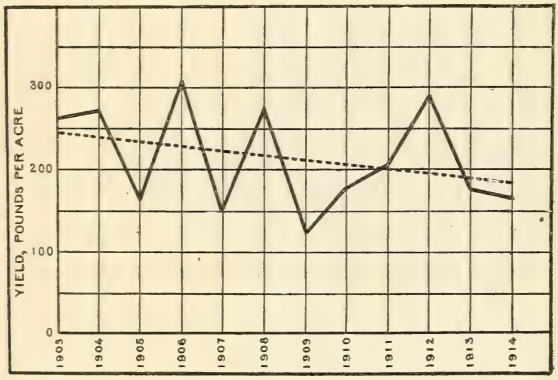

FIG. 9.—Variation in yield per acre of cotton from 1903 to 1914, Ellis County, Tex. (Data furnished by U. S. Bureau of Crop Estimates.)

The experience of farmers in Marlboro County, S. C., seems to offer a suggestion. That county long since reached the point where continuous cotton culture with no attention to soil fertility made a change necessary. To-day it has soil of wonderful yielding power. Its yield per acre of cotton is remarkably high. In this locality it was long ago learned that the application of commercial fertilizers would greatly stimulate the growth of cotton. The use of a little manure or vegetable refuse of almost any kind aided materially. It

is well known that soil, in order to be fertile, must contain a considerable quantity of decaying vegetable matter (humus). The farmers of Marlboro County have learned that after they have forced the yield of cotton to a bale per acre, the stalks and leaves of the cotton plant, if carefully returned to the soil, will keep it sufficiently supplied with vegetable matter. When the yield is less than a bale it is necessary to use more vegetable matter than this.

The sandy loam soils of Marlboro County, S. C., are quite different in character from the "black-waxy" soils of Ellis County, Tex., and doubtless require different treatment. From what is known of the black-waxy soils, it is probable that nitrogen is the only commercial fertilizer that would do much good on them. Heretofore the cheapest source of commercial nitrogen has been nitrate of soda. But this is now very expensive. Fortunately, the farmer is in position to produce his own nitrogen. This he can do by growing legumes, either for forage or as green manures. There are several legumes that can be sown in cotton fields late in the season and plowed under in the spring. Bur clover, crimson clover, and hairy vetch are examples. It is not known how these crops would behave on the black-waxy soils of Texas. It is believed, however, that they are worthy of trial on a small scale as above suggested. Any of them that will grow 4 inches high in time to turn under in the spring will add enough nitrogen to the soil to stimulate the growth of cotton very materially.

Another method of getting nitrogen and vegetable matter into the soil practiced extensively on a Georgia farm is as follows: Hairy vetch is sown between the cotton rows at the last cultivation. No further attention is paid to it until the time to plant cotton in the spring. A middle-buster is then run in the middles between the rows of old cotton stalks which are still standing. The dirt is then thrown back to the middles and the new crop of cotton is planted. It is cultivated sufficiently to keep the land clean near the new rows until the vetch, which is still growing on the old stalks, has matured to seed, the seed being allowed to fall to the ground for a new seeding. The old rows are then run over with a stalk cutter, and these and the vetch vines and seed are cultivated into the soil. The vetch seed comes up about the time the new crop of cotton is laid by, and the same process is repeated from year to year.

After the yield of cotton has been brought up to a bale or more per acre, it is probable that plowing under the cotton stalks and leaves will keep the Ellis County soils sufficiently supplied with vegetable matter to maintain good yields, especially if a little nitrate of soda is used, and careful use is made of such manure and waste vegetable matter as can be found about the farm.

The records show that on those farms which grow some alfalfa the cotton yields are higher than on others; but this can hardly be due

to the presence of the alfalfa, for a field of cotton following alfalfa is rarely found. There is no question that alfalfa would increase the yield of cotton for several years after an alfalfa sod is plowed up. At present alfalfa on these Ellis County farms is largely confined to small areas on exceptionally good land. Whether it would be generally profitable to the farmers of this region is not known, but the presumption is in its favor. It is certainly a crop that would be highly useful as a source of feed for the farm animals, and that would greatly increase the fertility of the soil. It should be tried more generally, but yet conservatively. It would hardly be wise to sow a large acreage of it until the farmer has learned with certainty how to grow it, and how it will fit into his system of farming. A small acreage of alfalfa is desirable on almost any farm where it will grow readily. To handle a large acreage of alfalfa successfully requires considerable experience, and is not desirable unless there is either a good market for the hay or plenty of live stock on the farm to consume it.

In sowing any legume new to a locality it is usually advisable to inoculate either the seed or the soil with the particular kind of bacteria that crop requires. Inoculating material for this purpose, with directions for its use, may be obtained from the United States Department of Agriculture. After the crop is once successfully grown, soil from where it grew can be used to inoculate the soil of other parts of the farm. Many farmers have failed with legumes because they neglected this matter of inoculation. Failure is certain unless the soil is already inoculated.

It is essential to the continuation of cotton farming in Ellis County, as well as in other parts of Texas, that the yield be maintained at a point as high as or higher than at present. Table XIV shows the relation of yield of cotton to income. The 115 farms are grouped according to yield per acre of cotton with 31, 33, 25, and 26 farms in the respective groups. The average yield per acre of these groups varies from 184 pounds of lint in the first to 323 pounds in the last.

TABLE XIV.—*Relation of yield of cotton per acre to income per farm (115 farms, Ellis County, Tex.).*

Yield of lint per acre.	Number of farms.	Average yield per acre.	Crop acres per farm.	Income above rent per farm.	Per cent return on investment.
		Pounds.			
136 to 208 pounds	31	184	120	$600	4.9
209 to 240 pounds	33	225	133	846	5.6
241 to 277 pounds	25	260	127	1,155	6.5
278 to 402 pounds	26	323	99	1,366	8.6
All farms	115	[a] 245	118	962	6.3

[a] Unweighted average.

This observation revives the question of ownership, to which allusion has already been made. It is not to the interest of the tenant to plant alfalfa even if he were encouraged to do so, because the profit of that crop from the first year's planting is comparatively small; it is valuable from the standpoint of yield because one planting suffices for several years. Under present customs the rental contract is usually for only one year. Without some change in the tenure system there will be further depletion of soil fertility. The contrary result is encouraged by ownership, for the owner has every reason for maintaining and increasing the fertility of the soil and the yield of his acres.

That the yield has a direct relation to income is shown by the percentage return on investment and by income above rent. Farms making an average yield of 184 pounds make a return of 4.9 per cent on the investment. The same farms make incomes above rent of $600. Each of these expressions of income increases as the yield per acre increases and almost directly in proportion to the amount of increase of yield.

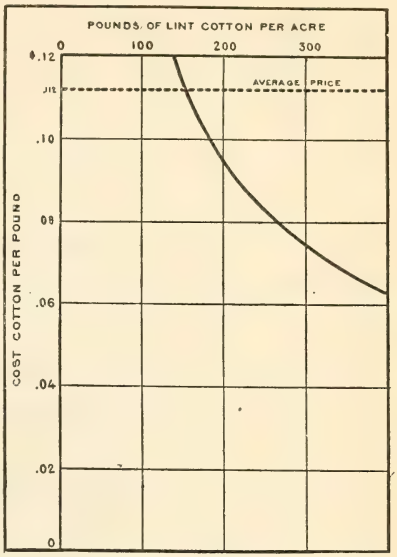

FIG. 10.—Relation of yield to cost of production of lint cotton (115 farms, Ellis County, Tex.).

The curve shown in figure 10 illustrates graphically the relation of yield to cost. It is seen that where the yield is as low as 155 pounds per acre, the cost of production is equal to the value of the cotton (11.2 cents per pound). As the yield increases the curve drops rapidly, so that when a yield of 400 pounds per acre is made the cost is slightly over 6 cents per pound.

TABLE XV.—*Relation of yield to cost of cotton (139 crops, 114 farms, Ellis County, Tex.).*

	Yield of lint per acre.				Average.
	200 pounds or less.	201 to 250 pounds.	251 to 300 pounds.	301 pounds and over.	
Number of crops	27	52	42	18	.....
Yield per acre (pounds lint)	170.3	226.7	274.7	344.6	245
Number man days per acre	4.82	5.44	6.00	6.79	5.65
Number horse days per acre	3.12	3.10	3.23	3.34	3.17
Rent per acre	$4.72	$4.90	$5.38	$5.80	$5.13
Man labor cost per acre	$8.75	$9.52	$11.74	$12.80	$10.46
Horse labor cost per acre	$4.62	$4.79	$4.90	$4.79	$4.79
Ginning cost per acre	$1.07	1.41	$1.72	$2.13	$1.49
Cost of lint per acre	$17.97	$19.47	$22.51	$23.97	$20.68
Value of lint per acre	$19.07	$25.36	$30.76	$38.60	$27.44
Cost of lint per pound (cents)	10.5	8.6	8.2	6.7	[a] 8.7

[a] Unweighted average.

Table XV shows the distribution of costs on cotton when different yields per acre are obtained. The cost of each crop of cotton on the 114 farms was computed separately, so that the averages are for crops and not for farms. The average number of days of man labor per acre increases with the yield, due to the increased amount of labor required for picking. However, the increase in yield from 170.3 pounds to 344.6 pounds is 102 per cent, while the increase of man labor is only 41 per cent. The average amount of horse labor required per acre for the crops making the lowest yields is 3.12 days, while on the crops making the highest yields the number of horse days required is 3.34. This is an increase of only 7 per cent. This table further shows that the rent per acre increases as the yield increases. The rent of crop land making yields of 170.3 pounds is $4.72, while that of the land making a yield of 344.6 pounds of lint is $5.80.

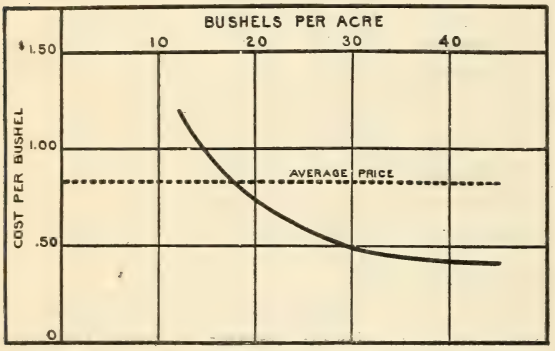

FIG. 11.—Relation of yield to cost of production of corn (115 farms, Ellis County, Tex.).

There is an increase in man labor cost per acre from $8.75 on the crops making low yields to $12.80 on crops of high yields, being an increase of 46 per cent. There is a slightly greater increase than in the number of man days required per acre on the same farms. There is scarcely any increase in cost of horse labor as the yield per acre increases.

The ginning cost, being a charge based directly on the quantity of cotton, increases directly with the yield.

The total cost of lint per acre increases 33 per cent, while the increase in value is 102 per cent. The yield per acre increases more rapidly than the cost per acre, so that as the yield increases from 170 pounds to 344.6 pounds the cost per pound decreases from 10.5 cents to 6.7 cents.

The same results were found for corn as for cotton, with only very slight variations. Figure 11 and Table XVI show the relation between yield per acre and the cost per bushel. When corn yields less than 18 bushels per acre, the cost is greater than the market value. The average yield of corn for the region was 25.6 bushels per acre at an average cost of 58.4 cents per bushel. As the yield increases beyond the average the cost continues to decrease, but not as rapidly.

The data from these farms indicate that the point has not yet been reached where the cost increases with the yield (law of diminishing return), but the curve would seem to indicate that this point for this region, and with methods now used, is not far above 50 bushels per acre.

TABLE XVI.—*Relation of yield to cost of corn (119 crops, 114 farms, Ellis County, Tex.).*

Yield per acre.	Number of records.	Average yield per acre.	Cost per bushel.
		Bushels.	
20 bushels or less	37	15.8	$0.94
21 to 30 bushels	62	27.5	.53
31 bushels or more	20	37.4	.45
All crops	119	25.6	.58

From these data concerning yields of the two principal crops, cotton and corn, it is apparent that considerable attention should be given to the matter of maintaining and even increasing the yields per acre. These relations may be expected to be affected by the use of manure, rotten straw, corn and cotton stalks, etc. In this section little effort is made to utilize these common fertilizers, manure being dumped in roads, stream channels, etc., while straw rots in the stack or is burned to make room for the planting of more cotton. The stalks of cotton and corn are frequently raked and burned, although the introduction of various types of stalk cutters (see figs. 17 and 18) makes it possible to get these humus-forming products into the soil again. Fortunately, the value of these various materials is becoming better known and more attention is being given to their utilization.

The size of the enterprise has some bearing on the yield of cotton. This is true on small farms as well as on the larger ones. A tabulation made on the basis of the proportion of crop land in cotton on each farm shows that where less than 60 per cent of the crop area is in cotton, average yields of 272 pounds of lint per acre are made. As the proportion of land in cotton increases to 86.2 per cent, the yield decreases to 230 pounds of lint per acre. On the farms where considerable areas of crops other than cotton are grown there is some change of crop on the same field from year to year. This of itself tends to increase yields.

Several varieties of cotton were found on the farms studied. One variety, known as Mebane's Triumph (see fig. 12), was predominant, 96 of the 115 farms producing this cotton. On 11 farms a number of varieties were found, among them being Rowden and Webb. On 9 farms the variety reported was "just cotton." Tabulations of yields of different varieties do not show material differences

in yield, and these averages are not reliable, on account of the small number of farms producing other than Mebane's Triumph.

The better farmers of the section follow a fairly uniform practice as to method of obtaining cotton seed for planting. They hold the opinion that cotton will "run out" or mix varieties in three or four years. To overcome this difficulty many buy pure seed every two or three years direct from the breeders of the respective varieties or from other sources furnishing pure seed. These farmers secure from 10 to 30 bushels each at a cost of from $1.50 to $2.50 per bushel. The second or heaviest picking of the cotton produced from this seed is ginned separately and the seed saved for the larger part

FIG. 12.—Mebane Triumph Cotton, the variety grown most extensively in the region. Big bolls, easily picked.

of the planting of the following year. If the second year's crop remains fairly true to variety, sufficient seed may be saved for a third year's planting.

VARIETIES OF CORN.

Records of varieties of corn were obtained from 78 farms. Thirty-seven farms produce some strain of yellow dent, 12 produce Bloody Butcher, and 10 produce Strawberry corn. On 19 farms "mixed" corn was reported. It is indicated that Strawberry corn gives slightly the best yields (29 bushels), but there is not a sufficient number of farms having the different varieties to determine reliable averages on this point.

COVER CROPS.

Scarcely any attention has been given in the region to the utilization of winter cover crops, with the exception of oats and a very little wheat. The fact that cotton picking often extends well into the winter season accounts in part for this condition.

It has been clearly demonstrated in other sections that a rotation of crops, even where no legumes are used, increases yields. Where legumes are included very marked increases are noted. For example, McNair, in Arkansas, found that where cotton followed cotton the average yield on 50 farms was 168 pounds per acre; following corn the yield was 197 pounds; following corn with cowpeas between the rows the yield was 251 pounds; and where cotton followed cowpeas (cut for hay) the yield was 270 pounds per acre. At 10 cents per pound the increased yield of cotton due to the previous crop of cowpeas was $11.73 per acre.

It is a well-known fact that the use of any cover crop tends to hold plant food in the soil, preventing its washing and leaching away. The use of legumes, such as vetch, crimson clover, bur clover, and others, actually adds the element nitrogen to the soil by taking it from the air.

These legumes may be planted between the rows of cotton, as winter wheat is now frequently planted in the black-land region, as soon as the cotton is picked. In the case of early maturing cotton, with a warm fall, the legumes should make a sufficient growth by the time of spring plowing to be of immense value when turned under. It is believed to be advisable for farmers on these black lands to experiment with these winter legumes as a possible means of increasing the yield of cotton.

FARM ORGANIZATION.

It already has been shown that cotton holds the most important place in the farming of Ellis County. A few farms in the county are dairy farms or diversified farms, but only one dairy farm and one diversified farm were found in this survey, and these were eliminated, since no reliable conclusions could be drawn from single instances.

It is not always possible to ascertain whether these types of farming found on a few farms in a locality could be successfully followed on farms generally in the region, though it is frequently possible to say they would not be successful generally. A few cases will illustrate this point. In Anderson County, S. C., a single farm was found that was doing well with hogs. The owner kept several brood sows, raised two litters of pigs a year from each of them, and sold the pigs at weaning time to neighboring farmers who wanted them

to feed from table scraps and other waste materials. This farmer's business was successful *because his neighbors were not keeping brood sows.*

In a survey of 270 farms at Monett, Mo., four dairy farms were found. They made good incomes. Three of them did so by supplying milk for the city of Monett. They occupied this field completely. The other made butter, and was successful only because the farm family was a very exceptional one.

A 25-acre farm in South Carolina was devoted exclusively to hay growing. It was highly successful because the hay was sold at high prices to neighboring farms *that did not produce hay.* Such cases as these tend to make farm-management investigators conservative in recommending changes in farm practice. They feel safe in recommending a new system only where a considerable body of local experience has grown up with it. However, such investigators frequently recommend *experiments* in a new direction. This is very different from recommending a new system of farming.

There is no well-established system of rotation in the region. Cotton occupies so much of the land that extensive rotation is not possible without a marked change in the system of farming. It is generally the practice to plant corn on the better land of the farm, preferably on bottoms, if possible. Legumes are found on only a few farms. A few farmers appreciate the value of rotations, and these make some effort to have a grain crop appear on all crop land once in three years. It is desirable to plant cotton on land previously occupied by grain on account of the fact that the fungus disease known as "root-rot" is not so prevalent under this condition. This disease attacks cotton and legumes (taproot plants), but not grains.

A study of this character does not give much information as to the value of diversified farming in a region like Ellis County. It is a study of farm experience, and local experience with diversified farming is so meager here that no conclusions can be drawn from it. Other types of farming might be better for the region than the one prevailing, but this can not be determined definitely in advance of experience, or at least extensive experiment, with a new system.

This study does reveal much of value concerning the details of the prevailing system. Some of the lessons bearing on these details are given in what follows.

CROPS.

Cotton.—In order to arrive at some indication of the proportion of the crop area that should be in cotton to make the best returns with the system prevailing in this region, a tabulation was made using the percentage acreage in cotton as the basis. The results,

shown in Table XVII, would seem to indicate that the acreage of cotton which produces the greatest immediate returns is found at about 80 to 90 per cent of the total crop area.

TABLE XVII.—*Relation of percentage acreage in cotton to percentage returns (113 farms, Ellis County, Tex.).*

Acreage in cotton.	Number of farms.	Per cent of total acerage in cotton.	Crop area.	Diversity index.	Per cent return on investment.
			Acres.		
25 to 63 acres	22	50.9	105.3	1.97	5.8
63 to 72 acres	21	68.1	125.5	1.51	5.9
72 to 76 acres	26	73.9	107.1	1.44	6.1
76 to 82 acres	23	79.0	138.9	1.32	6.8
82 to 99 acres	21	87.5	114.6	1.19	6.9
All farms	113	71.9	117.5	1.47	6.3

It is to be borne in mind that this observation is merely a record of the farming operations under survey. It is not intended to be advice to increase the percentage of cotton acreage, because for reasons already indicated cotton raising in this area is depleting the soil and the apparent profit on the farms under review is at the expense of soil fertility, well-balanced agriculture, and a wholesome rural development. The records show that if these important considerations are to be ignored, if the soil is to be "mined," and if social and family welfare are to be despised, the immediate profit upon the year's operation in a period of good prices will be greater with a cotton acreage of 80 per cent to 90 per cent of the total area than with less acreage in cotton. The average for all the farms in the survey is 71.9 per cent.

Right here we have the crux of the difficulty with Ellis County farming. The system that gives the best immediate returns is one that is gradually wearing out the soil,[1] and that seems to be headed straight toward its own destruction. Unless some change in practice is made soon, the average yield of cotton will become so low that the system will be unprofitable. Fortunate the region where the most profitable type of farming is one that maintains the fertility of the soil.

There are other disadvantages of this most profitable system here. It utilizes only a small part of the horse power on the farm. The man power is idle or poorly employed much of the time. The profitableness of cotton leads to the neglect of other essential features of good farming. The small provision made for producing food for

[1] This term is somewhat misleading. The soil does not actually wear out; its yielding power is reduced. But by suitable methods this power can be restored. The most essential factor in such restoration is the incorporation into the soil of plenty of decaying vegetable matter.

home consumption leads to a low standard of living on the part of farm labor.

Tabulations concerning the amount of receipts derived from the sale of cotton brought out the following: Where sales of cotton amount to less than 80 per cent of the total receipts the income is below the average; where cotton sales amount to from 81 to 90 per cent of the total receipts, the income is considerably above the average: where the receipts from cotton sales are over 90 per cent of the total, the income is very slightly above the average.

Corn and minor crops.—Corn occupied on the average for all farms 14.1 per cent of the crop area. Tabulations were made to determine the most profitable acreage of this crop, and to ascertain whether the production of corn for sale added to the farm income. The general result appears to be that those farms producing slightly more corn than was needed for home consumption were most profitable. The greater profit is believed to be due not to the fact that corn was produced for sale, but because a small surplus for sale insures an abundance for home use.

Practically the same was true for such crops as oats, sorghum for hay, kafir, milo, etc.

Again, attention is called to the fact that these deductions are the records of farming as practiced. It is a question whether better cultivation of corn and other crops would not yield better returns. It is the uniform habit in the cotton region for the farmer to give his best attention to his cotton, which represents his principal cash income.

Alfalfa.—This crop was found on only eight farms in this study. These farms were for the most part located on low lands, and had somewhat better soil than the average. The value of this crop as a source of feed for the farm animals is unquestioned. While no positive statements can be made as to its desirability for the farms of this region generally, it is believed that every farmer in the region should endeavor to grow at least a small area of it. It is a legume and requires inoculation unless the alfalfa bacteria are already present in the soil.

Another reason for experimenting with this crop is that, in case the present local system of farming fails, alfalfa is itself a very good money crop, and in connection with other forage crops may be made the basis of an excellent system of live-stock farming.

Live stock.—Farm animals may be divided into two classes, namely, work stock and productive stock, the latter being those kept for their products, such as meat, milk, wool, eggs, etc. The work stock on these 115 farms averaged 5.25 head per farm. The acreage of crops per work animal has already been discussed in connection with size of farms.

The number of productive live stock per farm is the equivalent of 4.26 mature animals. They consist usually of a cow or two for the production of milk and butter, a few hogs for meat, and a moderate-sized flock of poultry for eggs and meat. These products are intended mainly for home use, with frequently a small surplus for sale.

The quantity of such products sold from these farms was so small that it had little influence on the farm profits one way or the other, but it is to be noted that those farms making most profit generally produced slightly more live-stock products than were needed for home consumption.

Local experience with live-stock enterprises is not sufficiently extensive to make it possible in a study of this character to determine the desirability of such enterprises. But the fact that very few farmers here keep much more productive stock than are needed for home use would lead the careful student to be conservative in recommending the general extension of such enterprises. It is a fact that many farmers in this region have tried various live-stock enterprises from time to time on a considerable scale. The fact that almost no such enterprises remain indicates that local farmers have not found them so well adapted to local conditions as cotton farming. This may be due in part to lack of knowledge of stock farming on the part of local farmers. If for any reason cotton farming should become unprofitable, or far less profitable than now, it is probable that some type or types of stock farming would be found to do very well here. At present about all that can be said with confidence is that every farm should certainly keep enough productive stock to supply its own needs for their products. It would appear that these farmers generally do this. Furthermore, the records show that they raise practically all the feed needed by their live stock, which is in keeping with sound practice.

The farm needs include especially milch cows, hogs, and poultry sufficient to supply the family, with a little surplus. Such live stock, by consuming waste, by affording diversity of interest, by furnishing fertilizer, by encouraging the raising of winter cover crops, and by making sure abundant wholesome food for the family, return a much greater profit than would appear from bookkeeping records.

TABLE XVIII.—*Average value of feed per farm and per animal unit*[a] *(115 farms, Ellis County, Tex.)*

Number of work stock per farm	5.25
Number of productive animal units per farm	4.26
Total animal units per farm	9.51
Value per farm:	
Feed raised	$578
Feed bought	91
Increase in inventory	—9
Feed sold	162
Feed consumed	516
Value of feed consumed per animal unit	55
Value of feed consumed per work animal	83
Value of feed consumed per productive animal unit	19

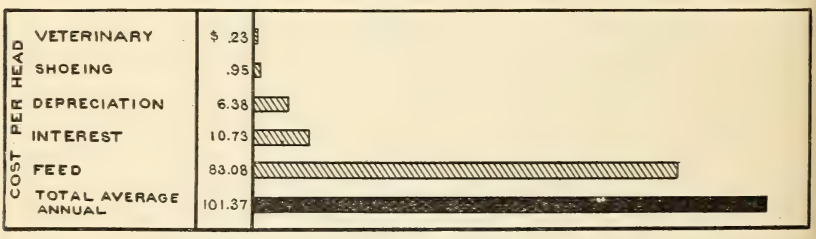

FIG. 13.—Proportionate cost of various items and the total annual cost of maintaining workstock per year (115 farms, Ellis County, Tex.).

Table XVIII shows the stock kept and feed on the average cotton farms of the region. The average value of feed raised per farm is $578 and the average value of feed bought per farm is $91. The total value of feed consumed per farm amounts to $516 or $55 per animal unit. Other data (see fig. 13) shows that the value of feed consumed by work stock is $83 per head. The average value of feed consumed by productive stock is therefore $19 per animal unit.

The following diagram, showing factors affecting the principal enterprises, is practically self-explanatory. It is intended to visualize briefly the summary of conditions, favorable or unfavorable, to the principal enterprises of the region.

[a] For definitions of the term "animal unit" see p. 3.

FACTORS AFFECTING PROFITABLENESS OF ENTERPRISES.

Enterprise.	Favorable conditions.	Unfavorable conditions.
Cotton	Cash crop—fair profit. Soil and climatic adaptation. Favorable market conditions. Utilizes labor of whole family. Size of farm. Low machinery requirements.	Depletes soil. Uneven distribution of labor. Keeps children from school for picking. Small percentage horse labor utilized. Root-rot.
Corn	Feed crop. Supplements cotton in labor distribution. Soil.	Depletes soil. Local market limited.
Oats	Utilizes labor otherwise unused. Winter pasture.	Climatic conditions—drought. Smut, rust. Big machinery requirements. Requires large amounts of labor for harvest and thrashing.
Sorghum	A sure crop-hay. Good yields. Drought resistant.	Limited market. Depletes soil rapidly. Very difficult to handle.
Wheat		Climatic conditions. Large labor requirements for thrashing. Requires big machinery.
Alfalfa	Improves soil. Even labor distribution. Fair yields.	Limited market. Root-rot. Presence of Johnson grass. Drought.
Stock	Utilizes waste feed. Soil improvement. Furnishes supplies for home consumption.	Limited pasture. Less profitable than cotton. Poor quality.

COST OF PRODUCTION.

Before discussing in detail the cost of production of the various crops found on the farms of Ellis County, a brief discussion is here given of the methods used in the determination. The items of cost considered were as follows: Rent of land; man labor, consisting of hired labor, family labor, and the operator's own labor; horse labor; equipment or machinery cost; interest on cash required to operate the farm; seed cost; ginning cost for cotton; and special costs on certain enterprises.

The rent of land was ascertained from each farmer. All cotton land when rented was worked on the share basis, one-fourth of the crop generally being the landlord's portion. All other crops, such as corn, oats, sorghum, and milo maize, when raised on rented land were produced either on the share basis or cash-rent basis. More often these crops, when raised by tenants, were produced on land for which cash rent was paid; for those crops where the landlord received a share as rent his portion was generally one-third of the crop produced. Since nearly 40 per cent of the land covered by the survey was worked by tenants, there was no difficulty in determining the cash rent per acre on any of the farms.

Since the rent per acre was determined on the basis of the amount that the landlords received as rent, this item covers a number of minor expenses, such as taxes, insurance of farm buildings, repairs of same, and building depreciation. The rent is determined, to a certain extent, by the yielding power of the land.

In arriving at the cost of man labor the three component parts were determined separately. The cost of hired labor, consisting of month hands, day hands, and contract work, such as cotton chopping, picking, etc., was obtained directly from each farmer. If any members of the family did field work, the value of this was obtained and considered as a cost. The value of the operator's own labor was obtained on the basis of what it would cost him to hire another to do his work of management and manual labor equally as well as he himself could do it. It is appreciated that this is an unsatisfactory figure, but tabulations have shown that on the average the farmers were consistent in their estimates of this figure. When rations were furnished laborers, or where members of the family did farm work, the cost of food bought or furnished this labor was included in the man-labor cost.

The cost of horse (or mule) labor was subdivided into the following items: Depreciation; interest on investment in work stock at the beginning of the year; feed cost; shoeing and veterinary charges; and cost of work stock hired by the month or year. Where a crew, consisting of men, team and machinery, was employed for a specific

purpose, the cost was charged directly against the enterprise on which the labor was performed. These items were totaled to make up the total cost of horse labor.

The equipment cost includes depreciation, repairs, interest, and insurance. The items of interest, taxes, and insurance together were found to be approximately 10 per cent of the value of the machinery, and this figure was therefore used in all calculations involving equipment cost. These items were totaled to determine the equipment or machinery cost per farm.

A certain amount of cash is required to run the business of each farm. In each case this amount was ascertained and interest at the rate of 8 per cent was charged on this figure.

The amount and value of seed required per acre were arrived at for each crop and the value was charged directly against the respective enterprises.

The cost of ginning cotton per bale was learned for each farm and was charged directly against this crop.

Various special costs, such as those for harvesting and thrashing grain, binder twine, baling hay, etc., were determined and charged directly against the respective enterprises. The number of days of productive labor was ascertained for each farm. This was learned by determining the acreage of each enterprise, the crew duty for each operation, and thus the number of days of productive man and horse labor for each crop. From the number of days of work utilized in the handling of productive stock, as well as in other minor enterprises, and the number of productive days of work outside of the farm, such as road work, outside hauling, etc., the total number of days of man-labor and of horse labor were arrived at for each farm.

Having ascertained the number of productive man days and horse days, the costs were prorated to the respective enterprises as follows: Costs of man labor and interest on cash to run the farm were distributed according to the number of productive man days required for the respective enterprises; the cost of horse labor and equipment cost were distributed to the enterprises according to the number of horse days required for each enterprise.

In this manner the costs were charged against the crops on the acre basis; these distributed costs, together with the separately apportioned special costs, were totaled, thus arriving at the acre cost of each crop. The yield per acre of each crop being known, the unit cost was calculated.

In the case of cotton two products are obtained from the gin, namely lint and seed. The total acre cost of cotton was distributed between the lint and seed according to the acre value of each product, on the basis of the net weight per bale of cotton, and the amount of seed produced per bale of lint.

The average rent of land was found to be $5.10 per acre. The rent of cotton land is slightly lower than land rent for the other crops, although the difference is very small.

MAN LABOR.

In Table XIX is shown the distribution of man labor cost per acre of all crops. It is seen that the total average cost is $8.76. That portion of the man labor cost in hired labor amounts to $3.39 per acre, while family labor amounts to $1.73. The operator's own labor is valued at $3.64 per acre. It was found that the cost of the operator's labor per acre decreases slightly as the size of the farm increases. The other items composing the man labor cost did not vary with the size factor to any appreciable extent.

TABLE XIX.—*Distribution of man labor cost for all crops (114 farms, Ellis County, Tex.*

	Cost per acre.
Paid or hired labor	$3.39
Family labor	1.73
Operator labor	3.64
Total man labor	8.76

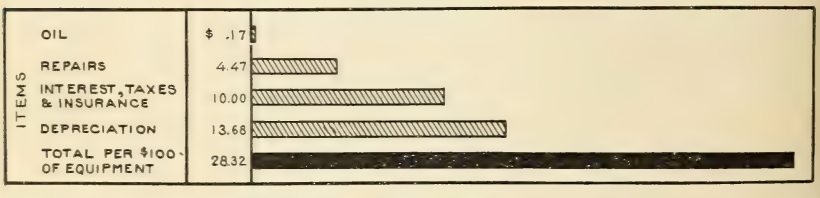

FIG. 14.—Cost of various items and total annual cost per $100 of valuation of operating machinery (115 farms, Ellis County, Tex.).

As the size of farm increases, the total amount of hired labor increases. The amount of hired labor per crop-acre is slightly higher on the larger farms, the average for all farms being $3.38. The total hired labor for the average farm is $397.

The total value of the labor of the operator's family increases as the size of farm increases, but the value per acre is slightly less on the large farms. The average total value of family labor on all farms is $203.

The average total value of the farmer's own labor on all farms, averaging 117.5 acres in size, is $427 per year. As the size of farm increases, however, the total value of the operator's labor increases, but not in proportion to the size. The value of the operator's labor on the group of farms averaging 62.5 acres is $4.45 per acre; on farms averaging 100.1 acres, $4.04; on farms averaging 188.9 acres, $3.17, and on all farms, averaging 117.5 acres, $3.64.

HORSE LABOR.

The average annual cost of work stock per head is $101.37[1] (see fig. 13). The average cost is almost exactly the same on large farms as on small. However, the cost per acre and the cost per day decrease materially as the size of farm increases. The annual feed cost per animal amounts to $83.08. The average value of this stock is $135 per head and the interest on this valuation at 8 per cent amounts to $10.73.

The annual depreciation of work stock is comparatively low on these farms, averaging $6.38. Very little shoeing is done for ordinary farm work; only where teams are used for hauling on the hard pike roads are they shod. The average cost per head per year is seen to be only $0.95. The veterinary cost is but $0.23 per head. Only an occasional animal is injured and very little disease is found in the region.

FIG. 15.—Barn, with overhanging eaves for machinery shelter.

COST OF MACHINERY.

The cost of maintenance and operation of machinery and tools is comparatively high in Ellis County. Figure 14 shows the relation of the various cost items to each other and to the total cost per $100 of equipment. The largest item is seen to be depreciation, which is equivalent to 14 per cent of the value of the machinery. According to this rate, the average life of machinery for the region is about 7

[1] This figure does not include cost of labor in caring for work stock. This labor is included in the nonproductive labor, all of which is distributed to the various enterprises.

years. There are two apparent causes for this high rate of depreciation of machinery. First, the farmers are not certain as to which cost is greater—to construct and maintain buildings for housing machinery (see fig. 15) or to allow the small amount of machinery required on the cotton farms to stand in the fields; as a rule, machinery sheds have not been constructed. Second, a large proportion of the farms are operated by tenants who own the equipment but do not own the buildings. The landlords are loath to construct buildings for the protection of machinery not their own. Depreciation of machinery represented 48 per cent; interest, taxes, and insurance, 35 per cent; repairs, 16 per cent; and fuel and oil, 1 per cent of the total annual machinery cost.

Figure 16 shows the relative cost of the various items after these were prorated to the acre basis. The total average acre cost of all

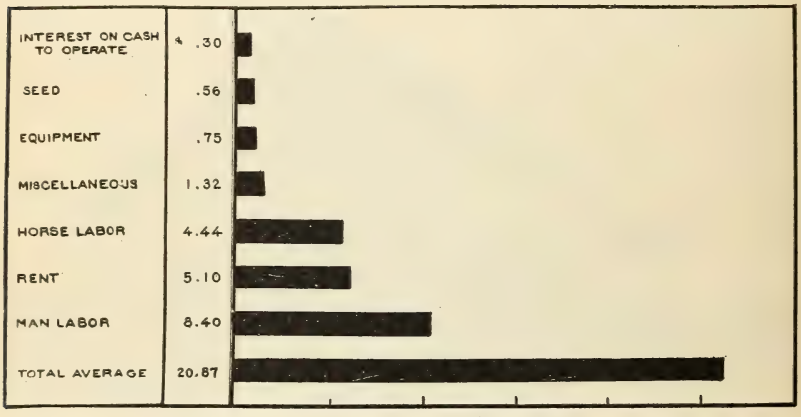

FIG. 16.—Cost of various items and total average acre cost of production of crops (115 farms, Ellis County, Tex.).

crops is seen to be $20.87, which is made up of the various items as follows: Man labor, $8.40; rent of land, $5.10; horse labor, $4.44; miscellaneous costs, $1.32; equipment cost, $0.75; seed, $0.56; and interest on the cash required to operate the farm, $0.30.

TABLE XX.—*Productive work units per acre on crops (114 farms, Ellis County, Tex.).*

Crop.	Man days per acre.	Horse days per acre.	Crop.	Man days per acre.	Horse days per acre.
Cotton	5.65	3.17	Alfalfa	3.49	4.96
Corn	1.99	3.27	Wheat	.72	1.27
Oats (grain)	.78	1.53	Miscellaneous	1.09	1.23
Oat hay	1.04	1.85	Average on all crops	4.77	3.19
Sorghum	2.02	2.94			

As previously stated, various costs were prorated to the enterprises according to the number of days of productive labor of man and

horse required, respectively. The data in Table XX show the relative amount of labor required for the various crops. Cotton requires an average of 3.17 days of horse labor per acre; two crops require more horse labor per acre than cotton, namely, corn and alfalfa, although sorghum requires nearly as much, being 2.94 days per acre.

Cotton requires more man labor than any other crop raised, being 5.65 days per acre. Alfalfa is next in amount required, being 3.49 days.

The grain crops of oats and wheat are noticeably low in amount of both man and horse labor required.

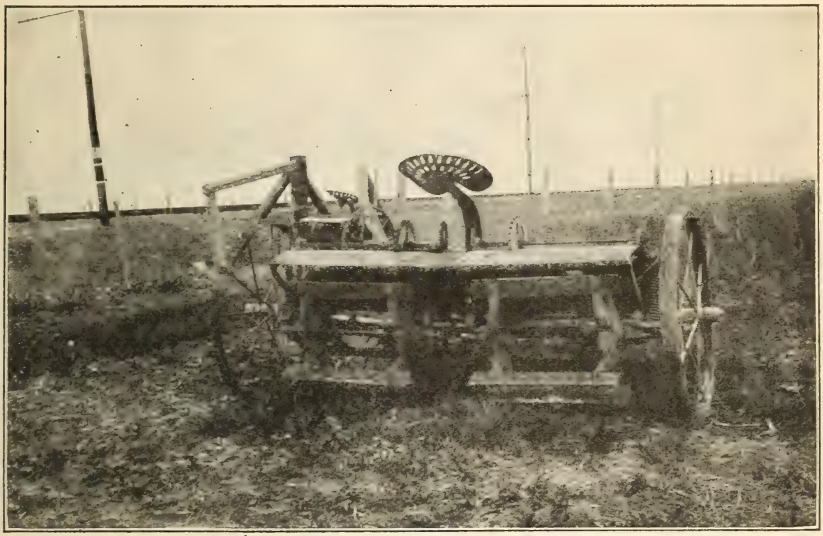

FIG. 17.—Type of two-row stalk cutter. The one-row cutter of the same type is more common.

RELATION OF AMOUNT OF TILLAGE TO COST.

There is a distinct relation between the amount of tillage and the cost of production. A group of 23 farms put an average of 2.88 days of labor on cotton, making a yield of 250 pounds of lint, at a cost of approximately 8.3 cents per pound. Another group of 21 farms, averaging 4.12 horse days per acre, produced cotton at a cost of 9 cents per pound.

The effect of these increased costs due to excessive tillage is noticeable in the returns on the investment. When 2.88 horse days were utilized, there was a return of 7.4 per cent, and where 4.12 horse days were used the return on the investment was only 5.8 per cent. The other groups ranged between 7.4 per cent and 5.8 per cent income on the investment when the tillage was between the limits above mentioned.

These data indicate that approximately three days of horse labor per acre gives the most profitable amount of tillage, either more or less than this amount showing a decrease in the net returns. The number of work animals making up the various crews will have some bearing on this figure; the larger the crews the less horse labor is required to accomplish the same results.

In figures 17 and 18 are shown types of implements utilized in cotton production. Each of these machines requires the use of two

FIG. 18.—A new type of stalk cutter which works on the principle of the lawn mower.

or more animals: by such utilization large acreages are covered in a day's work.

A study of figure 19 brings out the relation of the various items of cost to each other and to the total acre cost of cotton. It will be remembered that the average yield of cotton is 241 pounds of lint principal crops found on the 114 farms of Ellis County on which the various items are as follows: Man labor, $10.04; rent of land, $5.08; horse labor, $4.47; ginning, per acre, $1.49; equipment, $0.73; seed, $0.50; and interest on cash to operate the farm, $0.34.

A comparison of these items of cost with the same items for the average acre cost shows that man labor is considerably higher than the average and horse labor and equipment costs are slightly higher. Rent of land and seed cost of cotton are slightly lower than the average.

In Table XXI are given a summary of costs and values for the principal crops found on the 114 farms of Ellis County on which costs were determined. The average cost of cotton per acre is $22.65, the yield being 241 pounds of lint and 456 pounds of seed (Table

XXII). The value of lint and seed is $30.60 per acre. The lint cotton cost 8.3 cents per pound and sold at an average price (for 5 years) of 11.2 cents per pound.

TABLE XXI.—*Cost per acre, value, yield, and cost per unit of various crops (114 farms, Ellis County, Tex.).*[a]

Crop.	Number of farms.	Cost per acre.	Value per acre.	Yield per acre.	Cost per unit.	Value per unit.
Cotton	114	$22.65	$30.60	241 pounds..	$0.083	$0.112
Corn	109	14.92	20.76	25.6 bushels.	.584	.81
Oats	23	10.44	9.91	19.7 bushels.	.53	.51
Oat hay	74	13.12	12.59	0.94 ton.....	13.97	13.39
Sorghum	79	20.77	33.03	2.8 tons.....	7.42	11.81
Alfalfa	8	26.80	38.57	2.51 tons....	10.67	15.36
Other crops	107	16.75	23.88	.....	.....	.....
All crops, average	114	20.87	27.72	.....	.....	.....

[a] Weighted averages—that is, averages for the total acreage on all farms, considered as one farm. The averages are not averages of the average for each farm. The data are for 1914.

The average yield of corn is 25.6 bushels per acre, at a cost of $14.92. The average cost per bushel is 58.4 cents and the average value is 81 cents.

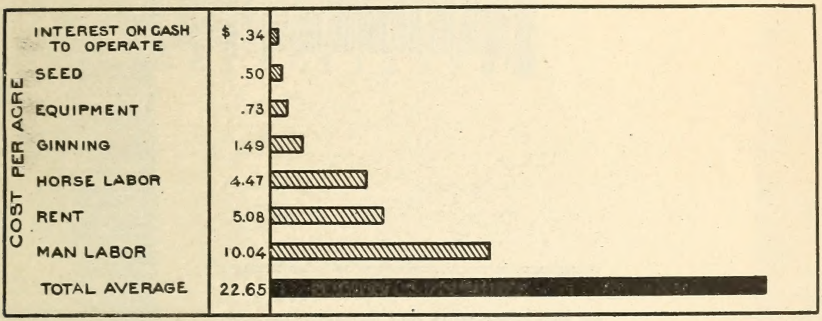

FIG. 19.—Cost of various items and total acre cost of cotton (115 farms, Ellis County, Tex.)

In 1914 the value of both oats and oat hay was less per acre than the cost. Oats for grain cost 53 cents per bushel and were worth 51 cents, while oat hay cost $13.97 per ton and was worth only $13.39. These data should not be considered reliable, on account of the fact that the yield was below normal.

The acre cost of both sorghum and alfalfa are comparatively high, but fair yields are made, so that the cost of sorghum per ton was $7.42 and of alfalfa $10.67. Sorghum hay is valued at $11.81 per ton, but scarcely any of this product is sold. Alfalfa sold for an average of $15.36 per ton.

There appears to be justification for extending the production of alfalfa. There can be no doubt of this as long as the market price stays at about $15 per ton. There can be but little doubt that from the standpoint of fertility of soil there should be an extension of this crop.

TABLE XXII.—*Cost and value of lint and seed (114 farms, Ellis County, Tex.).*

Cost of lint and seed per acre	$22.65
Proportionate cost of lint per acre	19.83
Proportionate cost of seed per acre	2.82
Cost of lint per pound	.083
Cost of seed per ton	12.34
Value of lint and seed per acre	30.60
Value of lint per acre	26.99
Value of seed per acre	3.66
Value of lint per pound	.112
Value of seed per ton	16.03
Yield of lint per acre—pounds	241
Yield of seed per acre—pounds	456

Table XXII shows the distribution of cost and value of cotton between lint and seed. Prorating the acre cost of lint and seed in proportion to the acre value, it is seen that seed costs $12.34 per ton. The average price received for seed is $16.03 per ton.

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